

Full Throttle

Pushing The Envelope Of Flight Simulation!

*June/July 1999
Volume 6 Number 3
USA \$7.95*

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R/C Pilot

FS Global Update

X-Wing Alliance

Flights of Fancy

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Photo-Realistic Scenery

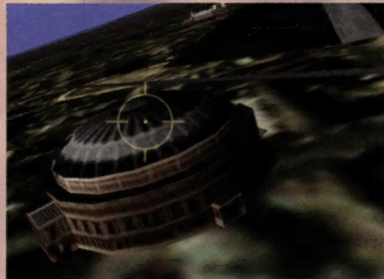
Justin Thyme



*Rediscover the romance and nostalgia of
flying perfectly recreated WWII planes.*



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Introducing Microsoft® Combat Flight Simulator.

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But don't expect a sight-seeing trip. Sure, the Eiffel Tower, Royal Albert Hall and other historically accurate landmarks are there in heart-stopping 3-D graphics. Unfortunately, with black smoke pouring through the shattered cockpit of your P-47D you won't see much.

And if that isn't thrilling enough, bring in thousands of planes from the Internet and engage in deadly dogfights over scenery imported from Microsoft Flight Simulator.

That's not all. Combat Flight Simulator also supports multiplayer and force feedback technology. So when you pull G's attacking the enemy, and the engine of your Spitfire cuts out, you'll know just how it feels.

After all, nothing beats the feeling of flying a historic WWII fighter. Except, of course, filling it full of lead and watching it plummet pitifully to the ground. Collect your orders and find out how Microsoft Flight Simulator owners can get a \$10 rebate at www.microsoft.com/games/combatfs



Microsoft®

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Full Throttle

Volume 8 Number 1 June-July 1999

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Pilot's Note: This information is not intended for use in actual flying situations. While the information is as realistic as possible, you should not use it for actual flying instruction. *Safe flying!*

From the Editor



The next six months promise to be the most bountiful that flight simulation enthusiasts have ever seen, and particularly so for general aviation hobbyists. Where before there was only one game in town, *Microsoft Flight Simulator*, we now expect to see *Sierra Pro Pilot 2000*, *Flight Unlimited III*, *Fly!*, and possibly another new version of MS Flight Simulator, *Flight Simulator 2000*.

An opinion on which of these simulators is the best will vary among flight simmers, and the convictions tend to range from a casual preference to absolute dogma. Where one long-time dedicated flight simmer may avow the superiority of simulator X, another may roar vituperatively that it is the worst contrivance since EDLIN. And that's fine, since disagreement is a traditional tenet among the populace of the free world. Let's face it, that's why we have horse races.

It's an exciting time for flight simulation

Where some view this contentious atmosphere to be interfering with the "spirit of the hobby," I find it to be most generative to the cause of virtual aviation, which is making virtual aviation truly "as real as it gets." Current Western social and economic dogma stipulates that competition generates advances in technology, and I believe this is certainly true when it comes to flight simulation. Just look at how far it has come just in the last two years, with functional 3-D acceleration, digital elevated terrain instead of the old "flat world" (see my feature article in this issue) and of course, functional almost-interactive ATC. And it has been primarily competition, that zeal to "one up" the other guy, that has been driving this evolution.

Third-party development

It is no secret that the relatively open architecture of the *Microsoft Flight Simulator* platform, formerly unearthed by talented flight simmer/programmers and more recently brought to a higher level by MS itself with their SDKs, has produced a tremendous third-party market, both freeware and commercial. And it is also no secret that the existence of this third-party development of add-on aircraft, scenery, navigation and ATC/adventure programs has given both Microsoft and hobbyists a tremendous benefit.

So far, Microsoft has been the only publisher to embrace this philosophy, and every signal we get from them indicates that this approach to the market will continue. It would be reasonable to assume that the past trend of Microsoft's, incorporating features and functionality now provided by third-party technology into the new rendition of their long-running program, will continue. But even though much of this technology will almost certainly appear as standard features in Microsoft's FS 2000, there will undoubtedly still be room for an expanded level of third-party

Continued on next page

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development, enhancing realism and functionality even more.

But unfortunately, I do not see very much enthusiasm among the publishers of the other simulators now on the market. In fact, in some cases I see motion in the opposite direction, and I find this very discouraging.

I'm not revealing any secrets by stating that I am personally very involved in the third-party development/add-on market in both the commercial and freeware arenas. So I do have somewhat of an ax to grind. In fact, I spend a lot more of my time creating scenery and panels for MS FS 98 and Combat Simulator than I do virtually flying. But I can tell you that I am far from the only one. I do not produce add-on software solely for the Microsoft renditions because of some undying, unswerving loyalty, although they do produce an excellent product. I do this because, when it comes to third-party development, it is simply the only game in town.

So, I encourage all of the other simulator publishers to explore this boundless third-party market. I believe that it would not only enhance their own place in the market, but that it would also give them access to a dimension of the hobby that they would otherwise be denying themselves: the real *participation* of the end user. This participation only enhances the enjoyment of the individual and that of the others he shares his contributions with.

This leads to more market share for the publisher and more enjoyment for the members of the flight-sim community.

And the cycle of competition continues.

Keep the blue on top!

Tim Dickens

Managing Editor

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Flight Sim Yoke

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The Next Generation

R/C Pilot

FS Global Update

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"European Air War's outstanding gameplay and wealth of features make it the current leader of the WWII simulation crop" -PC Gamer, 89%, Editor's Choice Award

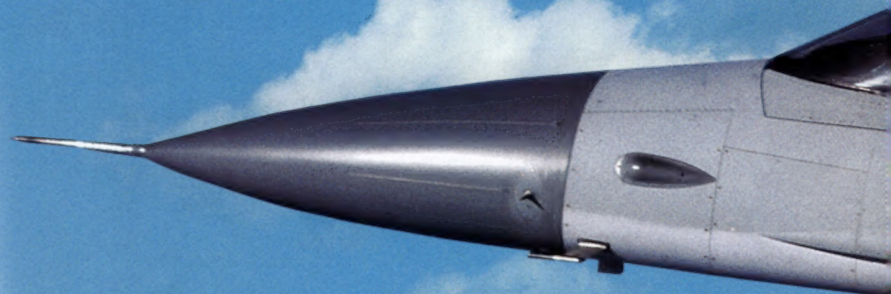
"This World War II simulation captured the feeling of being in a living, unpredictable combat environment better than any other sim released this past year"
-Computer Gaming World, 4 stars

"European Air War succeeds at providing the experience that makes arm-chair fighter pilots believe they're truly leaving their mundane surroundings behind"
-Gamespot

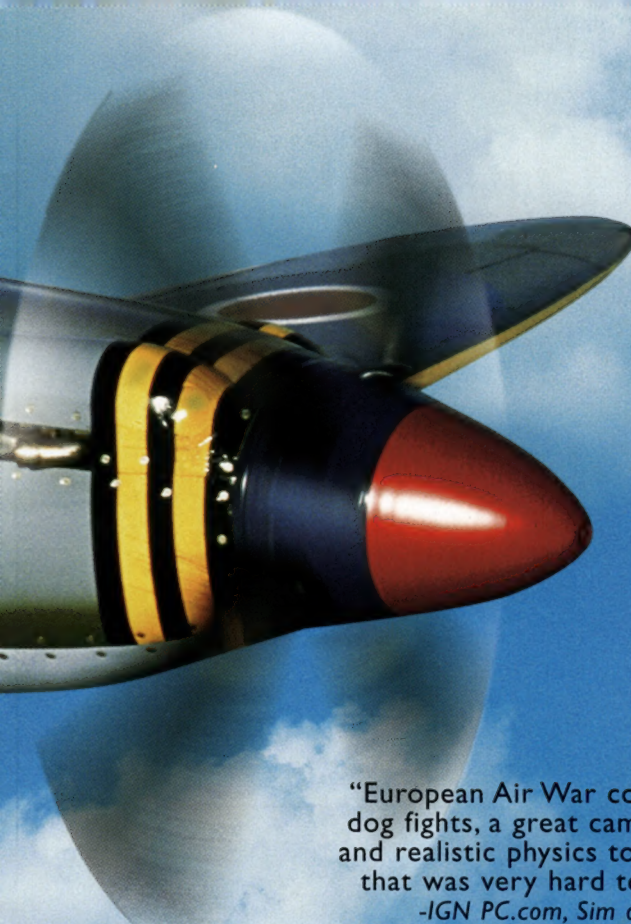
RACKING UP

"No previous sim covers so many different weapons and so many tasks in detail... it's all here and it's all beautifully executed"
-PC Gamer, 95%, Editor's Choice Award

"Falcon 4.0 is the deepest, most complex air combat sim yet... The campaign also creates the greatest sense of playing a small but important part of a huge battle" -PC Gamer



"Thoughtful gameplay design and the effort to bring players a sense of the true fighter pilot's experience can be felt throughout the game"
-Computer Games Strategy Plus



"European Air War combined huge dog fights, a great campaign system and realistic physics to make a game that was very hard to put down"

-IGN PC.com, Sim of the Year

"The care and attention to detail that went into every aspect of European Air War, from the hefty manual to the bomber nose art, represents a serious achievement"

-CNET GameCenter

THE KILLS!

"Bottom line: this sets the new standard in flight sims"

-Washington Post

"Falcon 4.0 is an incredibly detailed simulation that in many ways exceeds training systems in military use."

-Computer Gaming World



MICRO PROSE
www.microprose.com

NOTAMS: New Products

Grand Canyon

Scenery package

Developers at Wilco Publishing have joined forces with the team from Safari Fliteware to bring you a unique scenery package based on the Grand Canyon.

Based on aerial photographs and topographical data, Grand Canyon uses a 3-D elevated mesh terrain modeling system.

Features

- Eight Photo-realistic airports
- Airplanes included: Cessna Stationair (206 Centurion), De Havilland Twin Otter Vistaliner, Bell 430, Spitfire MK Vb USAF
- Real traffic at airports

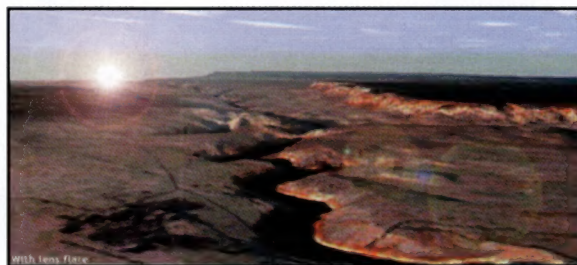
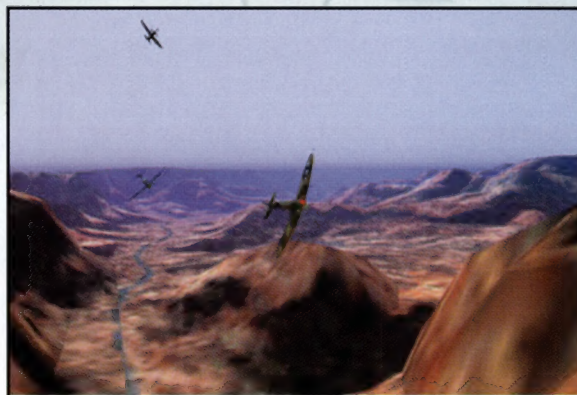
Adventures

- Search and rescue flights
- Official full-color Grand Canyon VFR Terminal Area chart
- VFR and instrument approach charts and airport diagrams
- Over 12,000 square miles (32,000 square km) and about 300,000 elevation points

Wilco claims that the whole airport environment has been modeled and recreated from photographs taken at each of the airports.

Grand Canyon

Wilco Publishing
P. O. Box 30
1620 Drogenbos
Belgium, Europe
Fax: +32.2.331.07.51
Internet: <http://www.wilcopub.com>
E-mail: info@wilcopub.com
SRP: \$34.00
Spring 1999



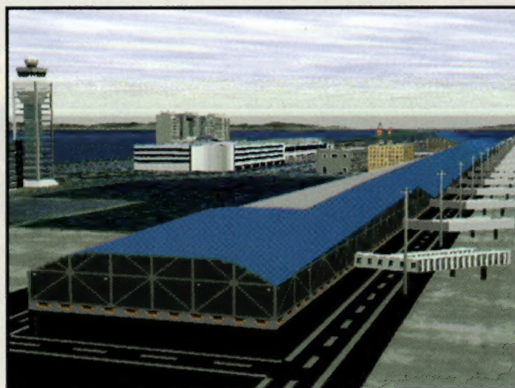
For those of you who aren't familiar with the term, NOTAMS is an acronym for NOTices to AirMen. The U.S. Government issues NOTAMS regularly. This issue of Full Throttle includes our version of NOTAMS — an expanded new products section. It's a regular part of our magazine. The products listed are compiled from press releases and information provided by the respective authors and companies who supply the products. We've taken steps to verify the information with each author or company, but cannot be responsible for inaccurate features, specification or availability dates.

Japanese Aircraft Collection

This highly detailed expansion pack for Flight Simulator provides a wondrous selection from Japan's commercial aircraft fleets. Also included is some very special scenery of Osaka rendered in unbelievable, photographic detail. Be it a short commuter hop in a Twin Otter or a 747-cargo flight bound from Tokyo to Los Angeles, Japanese Aircraft Collection delivers! This expansion pack includes everything you need to experience the thrill of the left-hand seat!

Features more than 36 different aircraft airlines, such as:

- Japanese Air Systems
- Nippon Airways
- Japanese Airlines
- Harlequin Air
- Air Nippon
- Japan Asia Airways
- Nippon Cargo Airlines
- Japan Transoceanic Air
- Japan Air Charter
- Japan Air Commuter



More than 13 aircraft, each with its own detailed panel and cockpit layout:

- Twin Otter
- Islander
- YS11
- A-300
- A-320
- 737-446
- 737-4Q3
- 767
- DC10-40
- L-1011
- MD-11
- 747-246
- 747 Cargo

Also includes amazing, superbly detailed scenery of Osaka—rendered to photographic detail of one meter per pixel! Plus, aviation charts and navigational information.

Japanese
Aircraft
Collection

Lago SNC
P.O. Box 293
22100 Como, Italy
Phone: +39 31 300174
Fax: +39 31 300214
Internet: <http://www.lagoononline.com/>
E-mail: 100411.3660@compuserve.com



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FOR THE DESKTOP PILOT**



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FLY! is a ground-breaking general aviation simulation featuring a global flight area and true satellite terrain imagery.



CH Flight Sim Yoke

Game Port - **\$84.99**

USB - **\$89.99**

New ergonomic designed yoke movement without a center detent allowing the ultimate in control.



Flight Director 99

\$34.99

Highly sophisticated package that integrates Real Weather, Flight Planning, GPS, EFIS, Weather Radar, and ATC.

CIVIL

Microsoft Flight Simulator 2000 **\$54.99**

Proflight 98 **\$38.99**

FS Global Upgrade **\$29.99**

Pro Pilot 2000 **CALL**

COMBAT

Flanker 2.0 (with \$20 rebate) **\$46.99**

USAF **\$44.99**

Mig Alley **\$44.99**

Apache Havoc **\$39.99**

HARDWARE

Elite Rudder Pedals **\$64.99**

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Gamecard III Automatic **\$29.99**

CH Pro Pedals **\$79.99**

DOWNLOADS

737 Panel & Aircraft **\$29.95**

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Flight Director 99 **\$34.99**

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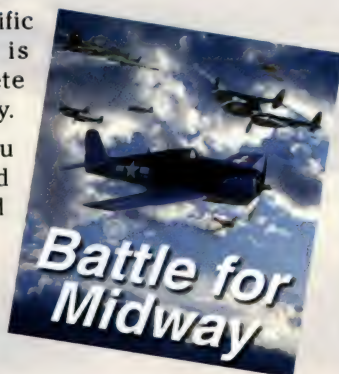
Battle For Midway

Aircraft, Missions and Scenery

Following the launch of the Pacific Theatre CFS add-on, Abacus is announcing their second complete add-on for CFS: Battle for Midway.

Battle for Midway brings you twelve of the most famous U.S. and Japanese planes from Midway and the Coral Sea era.

- Douglas SBD-3 Dauntless
- Grumman F4F Wildcat
- Douglas TBD-1 Devastator
- Brewster F2A-3 Buffalo
- Boeing B-17 Flying Fortress
- Aichi D3A-1 "Val"
- Mitsubishi A6M2 "Zero"
- Kawanishi N1K1-J "George"
- Nakajima KI43-I "Oscar"
- Mitsubishi G4M1 "Betty"
- BONUS: Lockheed P-38 Lightning
- BONUS: Kyushu J7W Shinden



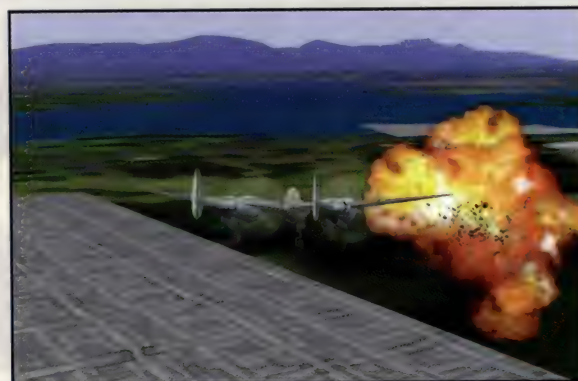
The Lockheed P-38 Lightning in Battle for Midway

Battle for Midway also includes the detailed scenery for the Midway Islands and the Coral Sea islands. Using new "elevated mesh terrain techniques." Additionally, Abacus includes "mission objects." These are "custom" 3-D objects that explode when they are hit with artillery fire.

Also includes historic missions:

- Attack on Kwajalein, Feb. '42
- Attack on Lae and Salamaua, March '42
- Search and destroy north of Louisiade, May '42

- Scramble from USS Lexington and Pt. Moresby, May '42
- Attack Japanese carriers, May '42
- Scramble to defend Midway, June '42
- Scramble from USS Yorktown, June '42



Battle for Midway

Abacus
5370 52nd Street SE
Grand Rapids, MI 49512
Toll Free: (800) 451-4319
Phone: (616) 698-0330
Fax: (616) 698-0325
<http://www.abacuspublisher.com>
E-mail: sales@abacuspublisher.com
SRP: \$39.95
Available September 1998

FS Planner 98

Sascha Felix introduces version 4.0 of his popular FlightSim Planner 98 utility. *Flightsim Planner 98* is a flight planner and navigational tool for *Microsoft Flight Simulator 98*. In addition to producing flight plans, FSP 98 features a GPS module, moving map and a weather generator that produces weather changes during your flights. Additional features include a fuel calculator, alternate airports, ICAO database with 10,000 records and 27,000 intersections.

Version 4.0 requires that V.3.5 be previously installed.

FS Planner 98

<http://www.simflight.com> (Shareware Center)
\$25.00 U.S. Dollars
E-mail: felix@phil.uni-passau.de
Fax: +49-851-9442112

NavStar 99

FMS and Moving Map

NavStar 99 is a package that includes two programs, an FMS (Flight Management System) and a Navigational Display (HSI and moving map). Both programs are fully compatible with Microsoft Flight Simulator 98's full-screen 3-D mode (3Dfx, etc.).

Like real aircraft, just by a click, the FMS can control your flight from take-off to touchdown.

FMS includes many new features, such as professional fuel planning, holding pattern with automatic entry selection, cross track error with automatic wind angle correction, desired track, Sid and Star, airways and much more.

NavStar 99 comes with a default worldwide database. It includes all FS98's airports, all of Canada's and many of Europe's. The database also includes around 50,000 nav aids (VOR, NDB) and intersections. When you're a registered user, you receive a free database update every month. A new database utility is included with the software, so you can easily add your own personal waypoints.



NavStar 99

NavStar Simulation, Inc.
1375, 158e rue
St-Georges, Québec
Canada G5Z 1A4
Fax: (418) 228-5716
Internet: <http://www.navstars.com/>
Registration: \$20.00 U.S.

Cockpit Collection

Keyboard Covers

Complicated keystrokes and key memorization makes the first few weeks of a new game frustrating and slow. Cockpit Collection Keyboard Control Covers were created to solve these problems in a creative, realistic, fun and inexpensive way allowing you to shorten your learning curve.



The keyboard covers are a second skin for your keyboard. These skins are highly detailed and give specific explanations on a soft plastic skin and thermoformed it so it will fit your keyboard. When the Keyboard Control Cover is laid on top of your keyboard, the graphics and adjoining text are automatically positioned above the appropriate keys, eliminating your need to remember the functions associated with the numerous keys.

- Dramatically lower your learning curve.
- Eliminate the necessity to remember the functions attributed to the numerous and anonymous keys of your keyboard.
- Add realism and style to your gaming environment.
- Allow you to switch from one game to another in no time, without confusion.
- Adapt to any PC-compatible rectangular (non-ergonomic) keyboard.
- Install easily.

Available for Microsoft FS98 and CFS, Jane's Longbow, DID F22-ADF Total Air War and Novalogic Comanche

Cockpit Collection

Cockpit Collection Ltd.
4398 Canterbury Crescent
North Vancouver, BC
Canada, V7R 3N6
Internet: <http://www.cockpitcollection.com>
Phone: (800) 322-8866 (this is 4Cds.com)
Fax: (604) 990-1478
E-mail: sales@cockpitcollection.com

Mad Dog

Advanced MD Super 80 series

Lago announces the new release of their MD 80 series add-on for Microsoft's FS98. Pilots refer to her as Mad Dog.

Features include:

- Two Panels
- STANDARD — designed for users not familiar with the real world procedures;
- EXPERT — for simmers that want to get the maximum realism out of the simulator.

Lago claims the panel author designed the panels with the cooperation of several real-world Super MD-80 pilots.



Planes and other features include:

- Super 80 Series
- MD-82
- MD-83
- MD-87
- MD-88
- Virtual panel
- Landing lights
- 4 detailed adventures
- Two manuals: Panel operations manual and test flight manual
- Enroute Chart as well as the SID and ILS maps of the airports.
- Checklist, supplied in a separate booklet

Mad Dog

Lago SNC
P.O. Box 293
22100 Como, Italy
Phone: +39 31 300174
Fax: +39 31 300214
Internet: <http://www.lagoonline.com/>
E-mail: 100411.3660@compuserve.com

Fuel Calculator 1.1

Fuel calculating utility

Fuel Calculator contains over 120 aircraft to choose in its database. All of the fuel burn numbers are accurate to real-world aircraft (at static thrust levels – econo-cruise) with 5% added to compensate for fuel burned during take-off.

An Excel chart with aircraft ranges and fuel capacities has been included to allow users to edit their .AIR files accordingly.



Fuel Calculator

Bryan Samis
E-mail: CyberBry@tripod.net
Download:
<ftp://ftp.iup.edu/flight-sim/uploads/fuel11.zip>
Freeware

Airbus 2000

Airbus aircraft and panels

Horizon Software Publishing releases Airbus 2000—the ultimate Airbus fleet for Microsoft Flight Simulator 98 and featuring over 40 detailed Airbus airliners and cargo aircraft in liveries from around the world with the most authentic panels and sounds available. Airbus 2000 includes the A300, A310, A319, A321, A330 and the A340. Airbus 2000 also ships with the mighty Beluga!



Airbus 2000 also claims the first Ground Proximity Warning System (GPWS) incorporated into a working Flight Simulator gauge. This system features user-controlled height calibration and

decision height, with sounds recorded from the actual Airbus system. Detailed and fully functional instrument panels are provided for each aircraft.



A Right-Seat View from the A-319

Horizon has added a 30-minute MPEG movie on its CD-ROM containing real-life footage of actual aircraft featured in Airbus 2000. In addition, a pilot's manual containing all of the information you need to fly each of Airbus 2000's aircraft "by the book" is included.

Airbus 2000

Horizon Software Publishing
1450 Fashion Island Blvd.
San Mateo, CA 94404-2064
Internet: <http://www.fsaddon.com/>
Spring 1999

Apache Havoc

Combat Helicopter Sim

Apache-Havoc claims highly accurate flight sims of two of the world's deadliest attack choppers: the US Apache and the Soviet Havoc, allowing gamers to experience true head-to-head superpower sim action.



Features

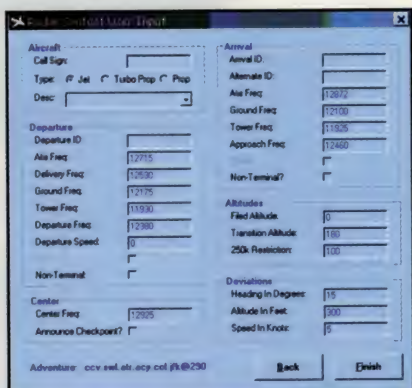
- Two combat helicopters: the US AH-64D Apache Longbow and the Russian Mil-28N Havoc B
- A 3-D engine specially designed for low-level helicopter combat, which renders a highly sculpted terrain, enabling gamers to use natural and man-made features in true combat tactics. Now you can actually hover above a forest road, hiding behind the trees, out of the enemy's line of sight.
- Detailed and articulated 3-D models, even down to rotor blades which droop as they slow
- Dynamic Campaigns giving the player many missions and a different campaign every time
- All-weather missions, including day, night, dusk, dawn and "real" rain and snow
- Full multiplayer dynamic campaign support, via serial, modem, LAN or Internet
- Detailed cockpit graphics including 30 in-cockpit views, plus a 3-D modeled virtual cockpit
- Direct 3-D support, to ensure that most 3-D accelerator cards are supported

Apache Havoc

Empire Interactive
580 California Street, 16th floor
San Francisco, CA 94104
Phone: (415) 439-4854
Fax: (415) 439-4928
Internet: <http://www.empire-us.com>
April 1999



Radar Contact takes flight plans created by third-party flight planners and generates adventures, and provides a realistic flight experience, adhering to the 7110.65 FAA rules.



Features

- ➔ Tracon will assign headings, altitudes and speeds concerning the traffic load and sequence you with vectors to downwind entry, base and final.
- ➔ Supports Flight Sim Planner 98. Support for SuperFlight Planner and WinPlanner to follow soon.
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- ➔ Realistic center handoffs while enroute.

Radar Contact
99

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Ellendale, TN 38029-0565
Internet:
<http://www.flightsimmers.net/radarcontact/>
E-mail: rcdt@midsouth.rr.com
Registration: \$28.00 U.S.

Desert Fighters

WWII Combat Simulator

Dynamix announced development of Desert Fighters as the next title in the line of Dynamix flight simulations. Desert Fighters, scheduled to ship in October 1999, is a World War II-based, low-level, in-your-face air combat simulation that depicts the struggle for North Africa between March 1941 and December 1943.

Desert Fighters will feature 30 aircraft, with approximately 18 flyable models. Included in the simulation are aircraft from WW II, such as the multipositional Ju-87 Stuka. Other aircraft include the Italian Macchi MC 202 and the French Dewoitine D 520, along with the famous Spitfire and the P-51 Mustang.

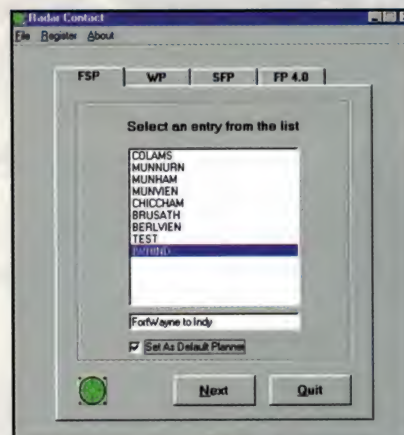
Desert Fighters will support Glide and Open GL 3D.

Desert Fighters contains training missions, single-player campaigns and free online multiplayer available via designated and independent servers, giving gamers an arena with over 60 players flying and fighting simultaneously. Players will also be able to compete on the same computer without logging onto the Internet through the game's Hot Seat Competition feature.

Desert Fighters

Dynamix
1600 Millrace Drive
Eugene, Oregon
Phone: (541) 343-0772
Fax: (541) 334-1754
Internet: <http://www.dynamix.com>
October 1999

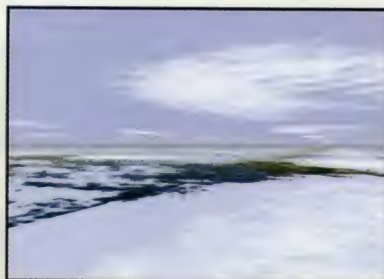
**See page 75 for a complete review of
Radar Contact**



Clouds.Zip

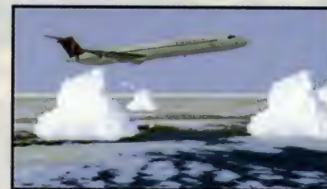
Realistic Cloud.r8 Replacement

Dr. Michitaka Suzuki has created a CLOUD.R8 replacement texture for FS98. Based on real cloud photography, Dr. Suzuki's CLOUD.R8 texture provides a much more natural cloud appearance and truly enhances the FS98 flight experience.



Radar Contact 99

Dr. Michitaka Suzuki
<http://www.mech.eng.himeji-tech.ac.jp/sanki/home1/flight/flightte.html>
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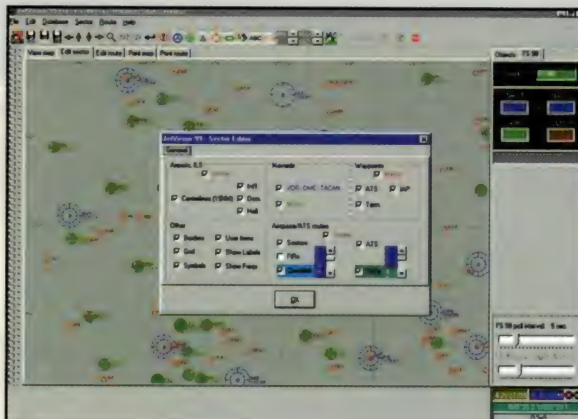
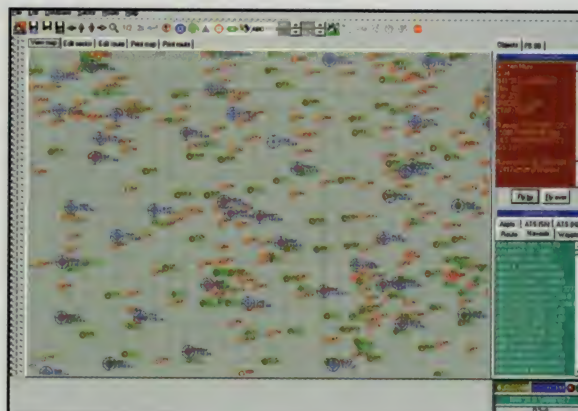


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Internet Sites for Simmers

by Adam Howe

Growing up, I aspired to become many things, including the usual fireman, policeman, doctor and even a fighter pilot. Well, since none of the above panned out, at least now I can pretend to be a fighter pilot with Microsoft's *Combat Flight Simulator* (CFS). Here are a few Websites I found that helped me make the most of my fighter pilot dreams in CFS.

Today's campaign will include stops at SimCombat, CombatFS, After Burn and Migman. Beginning at <http://www.simcombat.com>, I found a great place to get armed with almost everything you can use in Combat Flight Sim.



From this site, you can download missions, campaigns and freeware as well as shareware aircraft. You'll also find an abundance of helpful information in tutorials, tips, FAQs and even a Forum to post your questions and comments about CFS.

Continued on page 57



The United States Air Force Museum

Q.: Where can one experience the complete history and evolution of aviation, from man's primitive dream to tame the air to his ability to conquer earth's skies at incredible supersonic speeds?

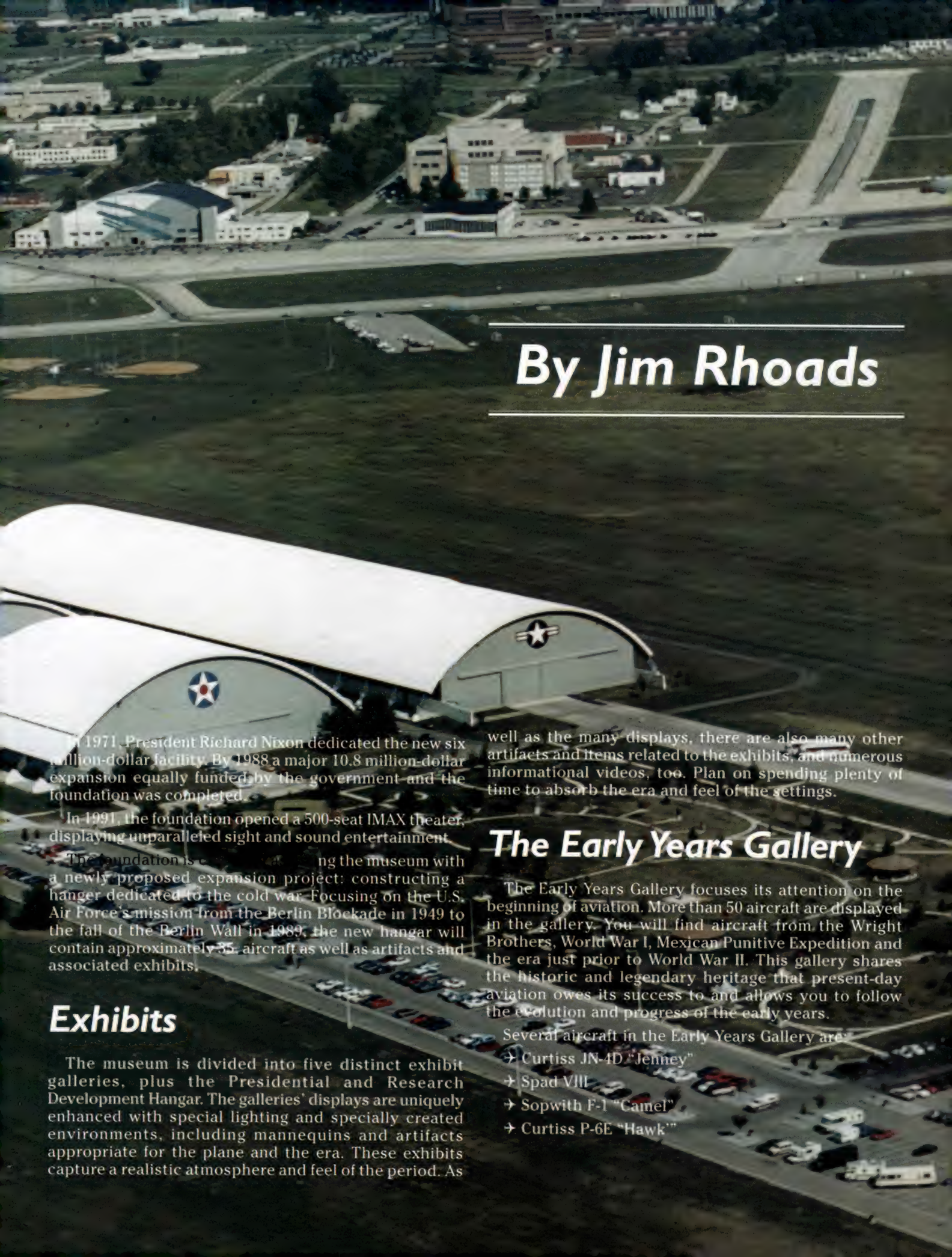
A.: One place, where it all started—Dayton, Ohio. Who would have thought that two bicycle mechanics from Ohio would revolutionize the world in a way unprecedented in the history of man, all with a short, humble flight accomplished by pursuing a dream?

The United States Air Force Museum is at the Wright Patterson Air Force Base near Dayton, Ohio. Here you will find everything from the original Wright 1909 Military Flyer to the YF-22 Raptor, and everything in between. Furthermore, the museum is internationally

recognized as the oldest and largest aviation museum in the world, with over 10 acres of aircraft and exhibits.

History

The museum was established in 1923 in the corner of an aircraft hanger at McCook Field near Dayton, and it moved to Wright Field in 1927. Due to the need for administrative space to support the war, the museum was closed to the public from 1940 to 1955. The increasing interest in aviation helped create the Air Force Museum Foundation, Inc. in 1960. Soon the AFM Foundation launched a national fund raising campaign to finance a larger, more modern facility, and by the end of the decade, construction was underway.



By Jim Rhoads

In 1971, President Richard Nixon dedicated the new six million-dollar facility. By 1988 a major 10.8 million-dollar expansion equally funded by the government and the foundation was completed.

In 1991, the foundation opened a 500-seat IMAX theater, displaying unparalleled sight and sound entertainment.

The foundation is continuing the museum with a newly proposed expansion project: constructing a hangar dedicated to the cold war. Focusing on the U.S. Air Force's mission from the Berlin Blockade in 1949 to the fall of the Berlin Wall in 1989, the new hangar will contain approximately 35 aircraft as well as artifacts and associated exhibits.

Exhibits

The museum is divided into five distinct exhibit galleries, plus the Presidential and Research Development Hangar. The galleries' displays are uniquely enhanced with special lighting and specially created environments, including mannequins and artifacts appropriate for the plane and the era. These exhibits capture a realistic atmosphere and feel of the period. As

well as the many displays, there are also many other artifacts and items related to the exhibits, and numerous informational videos, too. Plan on spending plenty of time to absorb the era and feel of the settings.

The Early Years Gallery

The Early Years Gallery focuses its attention on the beginning of aviation. More than 50 aircraft are displayed in the gallery. You will find aircraft from the Wright Brothers, World War I, Mexican Punitive Expedition and the era just prior to World War II. This gallery shares the historic and legendary heritage that present-day aviation owes its success to and allows you to follow the evolution and progress of the early years.

Several aircraft in the Early Years Gallery are:

- Curtiss JN-4D "Jenny"
- Spad VIII
- Sopwith F-1 "Camel"
- Curtiss P-6E "Hawk"

The United States Air Force Museum

Air Power Gallery

As the name implies, this gallery immerses you in the Air Power years of World War II. Many areas of focus include The Pacific and European Theatres, research and development of the post-WWII era and the evolution of the USAF major commands. World War II was a devastating yet exciting time for the United States. I am always amazed at the spirit and unity that World War II drew from our nation and the men and women that defended it. These men were true aviators and command the highest respect in my book.

Mostly armed with a compass, a map, the stars and a God-given sixth sense, they dove into the unknown to protect that which we take for granted. This is something to think about the next time your GPS blinks out and you become disoriented for a moment and have to break out the maps and charts.

Here you will find true workhorses like the Lockheed P-38L and historic aircraft that changed the face of our nation, like the actual Boeing B-29 "Bockscar" that dropped the atomic bomb on Nagasaki in August 9, of 1945, leading to the surrender of the Japanese government.

The Air Power Gallery truly tells the story of the mighty planes of World War II. The gallery includes more than 40 aircraft:

- Northrop P-61C "Black Widow"
- North American F-82B "Twin Mustang"
- Messerschmitt ME 262A "Schwalbe"
- V1 Buzz Bomb
- Supermarine Spitfire MK XI
- Lockheed T-33A "Shooting Star"
- Consolidated B24D "Liberator"
- Republic P-47 "Thunderbolt"

Korean War/Vietnam Conflict Gallery

The date was June 25, 1950. Communist North Korean troops began a sneak attack in the early morning hours, crossing the 38th parallel on a mission to conquer the Republic of Korea. On June 27th four F-82s (Twin Mustangs) were flying protective cover for American evacuees near Seoul, when two North Korean YAKs attacked the U.S. fighters, resulting in the loss of the YAKs. This began the Korean Conflict.

As in the previous wars, the U.S. entered unprepared, with mostly WWII prop planes and a few F-80 Shooting Stars. These ushered in the age of jet fighters.



The North American F-100C "Super Sabre" is in the Korean Conflict Gallery.

Although recently labeled the "forgotten war," Korea was actually one of America's most significant conflicts. The Korean Conflict began the buildup of U.S. forces in the North Atlantic Treaty Organization (NATO) and advanced our involvement into the Vietnam War.



The XB-70, shown here with the B1B bomber, was conceived for the Strategic Air Command in the 1950s as a high-altitude bomber that could fly three times the speed of sound.



The United States Air Force Museum



The Lockheed-Boeing-General Dynamics YF-22 "Raptor" is in the Modern Flight Gallery

This gallery and everything in it falls under the shadow of the enormous Convair B-36J. I had brought my dad with me on this trip and surprisingly, I learned that he had spent some time in the B-36J while in the service.

The Korean Conflict Gallery exhibits approximately 20 aircraft, covering the Korean Conflict of the early 1950s through the Vietnam era of the 1960s and 1970s, featuring examples such as:

- North American F-86A
- North American F-100C "Super Sabre"
- Republic F-84E "Thunderjet"
- Republic F-84F "Thunderstreak"
- Cessna YA-37A "Dragonfly"
- Lockheed F-94A "Starfire"
- MiG-15 "Fagot"
- Convair F-102A "Delta Dagger"

Modern Flight Gallery

The Modern Flight Gallery is the largest and newest of the museum's display galleries, containing more than 60 examples of modern-day aircraft. The gallery contains many current aircraft, as well as legendary experimentals like the North American X-15A-2, Lockheed SR-71A "Blackbird" (my favorite) and the incredible North American XB-70 "Valkyrie." Truly, this gallery is a speed freak's paradise. Knowing a lot about the history of some of the skunkworks aircraft and other secret research planes left me in total awe when in the presence of them.

I could not help but see myself in these planes as I tried to capture what it might have felt like knowing that you were about to try something that no other human has ever done. Laying my hand on the X-15 and realizing that this same metal skin had been heated up close to 1,200° F at a speed of 4,520 mph (unofficial record) and into the outskirts of the earth's atmosphere, 354,200 ft. (67.08 miles) high still leaves me awe struck.

On the other hand, The XB-70, one of the world's most exotic airplanes, was conceived for the Strategic Air Command in the 1950s as a high-altitude bomber that could fly three times the speed of sound (Mach 3).

A unique characteristic of the Valkyrie's configuration was its ability to ride its own supersonic shock wave. Called *Compression Lift*, this principle reduced drag and was the secret of the XB-70's performance. To improve stability at supersonic speeds, the Valkyrie could droop its wingtips up to 65 degrees.

Its design features include a movable canard, in-flight accessibility to electronics equipment, a shirt-sleeve environment for the crew, and encapsulated seats for crew ejections at speeds up to Mach 3 and at altitudes above 70,000 feet. I will not give away too much information on this plane. Look forward to an exclusive article in *Full Throttle* on the XB-70 and other legendary aircraft.

Other aircraft in the Modern Flight Gallery include:

- Lockheed U2A
- Lockheed-Boeing-General Dynamics YF-22 "Raptor"
- McDonnell Douglas F-15A "Eagle"
- Convair B-58A "Hustler"
- Lockheed F-117A "NightHawk"
- Bell X-1B
- Boeing B-52D "Stratofortress"
- General Dynamics F-111A "Ardvark"

Space Gallery

The Space Gallery contains many examples of the development of the rocket engines and boosters that propelled the United States in the "Space Race." Here you will find numerous exhibits, ranging from the father of modern rocketry, Dr. Robert H. Goddard, to the Apollo 15 Command module. You can learn about life support systems, space suits, space sleds, satellite research,

The United States Air Force Museum

space hardware, experimental space vehicles and more. There are many examples of space-related items here, such as:

- Martin X-24A
- Boost Glide Reentry Vehicle (BGRV)
- McDonnell Gemini Spacecraft
- McDonnell Mercury Spacecraft
- Discoverer XIV Satellite
- Marquardt Space Sled
- North American Rockwell Apollo 15 Command Module
- Rocketdyne S-3D Liquid Rocket Engine

It is sometimes easy to view the space program with a shallow understanding of what it really accomplished.

Because the United States elected to pursue the space race, we have developed many new technologies as a direct result of our drive and passion to explore, understand, and even use that which is beyond our immediate reach. The ability to defend our country with greater accuracy can be linked to our dedication of satellite research and development. And who would have thought 20 years ago that we would be relying on satellite navigation to guide our travels? Advancements in television entertainment, weather and communications, mapping, hunting, fishing, etc., can all be linked to our involvement in the space program.

Presidential and Research Development Hangars

About a mile from the main museum, you can find a twin hangar facility that forms the Presidential and Research Development Hangars. Here you will find the largest collection of presidential aircraft anywhere, as well as many experimental aircraft. The Presidential hangar contains planes such as Harry Truman's personal plane, the Douglas VC-118 "Independence." Air Force One Boeing 707 VC-137C has been in service for every president since Kennedy, and it carried his body from Dallas to Washington, D.C. President Roosevelt's C-54 "Sacred Cow," President Eisenhower's "Columbine III" and U4B, President Johnson's "King Air" and Saberliner, and a Jetstar used by the Nixon, Ford, Carter and Reagan administrations are also found in the Presidential Hangar.

The Research and Development hangars will soon house some of the experimental craft now found in the Modern Gallery.

Restoration

Obviously, many of these rare, historic aircraft do not come to the museum in display condition.

Where are they restored, and who does it? I just happened to be fortunate enough to find out on my visit. The museum's Restoration Division does all of the maintaining and restoration of the more than 300 aircraft and missiles on display at the museum and is responsible for moving the indoor and outdoor displays. Many of the crew members are highly skilled craftsmen in the arts of woodworking and sheet metal fabrication and repair. Some have backgrounds in World War aircraft and others in newer technology fighters.



These fellows are the backbone of the marvelous aircraft that you see on display, the unseen artists. All repairs are completed just as if they planned the aircraft to be put back into service. In other words, they could fly, but probably never will. Current projects include the **SPAD XIII**, built in 1918. It was donated to the museum in 1996. This aircraft belonged to Cole Palen, who flew it until the late 1950s. This type of aircraft was also flown by ace Eddie Rickenbacker in WWI.

(Facing page)

The museum's Restoration Division maintains and restores over 300 aircraft and missiles on display at the museum. Many of the crew members are highly skilled craftsmen in the arts of woodworking and sheet metal fabrication and repair. Some have backgrounds in World War aircraft and others in newer technology fighters.



The United States Air Force Museum



The United States Air Force Museum



The **Kawanishi N1K2 Shinden Kai** was more commonly known in WWII as “**George 21**.” As is well known, not many Japanese fighters survived WWII, and this “George” is one of only three known to be in existence.

Army Air Corps A-17A: Produced in the 1930s, this model was found in a pecan field in Georgia and is the only one known in existence.

This **XF-92** (formerly on display at the University of the South) was flown by Chuck Yeager. Many of the parts for the XF-92 are being hand fabricated to replace the missing and damaged pieces.

The United States Air Force Museum has agreed to let *Full Throttle* follow the George 21 and A-17A through refurbishing in a series of stories, from the beginning phases up to completing these rare aircraft restoration projects.

Other Areas of Interest

Research and Archives

The museum offers much more than just static aircraft displays and tours. The museum’s research division contains over two hundred thousand documents, manuals, books, drawings, etc., that are available for research projects. If you have a credible need of research data, the museum offers this service as an aid to assist in such projects of professional nature. Much of the research data is used by the museum to determine how projects should be reconstructed to insure accuracy and detail.

Archives

The museum archive contains thousands of historical artifacts, many of them on display: authentic bomber and fighter squad jackets, WWI and II photographs and posters, aerial maps, southwest Pacific propaganda leaflets, medals of honor, etc. Just carefully looking over the artifacts could take a full day.

Departure

The museum is open from 9 a.m. to 5 p.m. daily, excluding Thanksgiving, Christmas and New Year. Admission and parking are **free**. The museum is located six miles northeast of Dayton, Ohio off Interstates 70 and 75 to Interstate 675, at the Col. Glenn Highway exit. Get more information by writing to:



The United States Air Force Museum

The United States Air Force Museum

1100 Spaatz Street

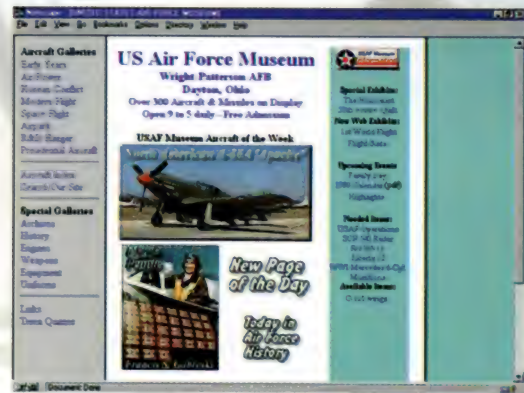
Wright-Patterson Air Force Base, Ohio 45433-7102

(937) 255-3286



The museum also maintains an award-winning Web site that will allow you to "virtually" tour the entire facility and gain valuable information. You might even look a little smarter to your friends.

You can access the museum Web site at www.wpafb.af.mil/museum/.



Access the museum Web site at
www.wpafb.af.mil/museum/

Full Throttle will be traveling back to Wright-Patt to keep you abreast of some of the more interesting things going on at the facility as well as follow the restoration process of the rare A-17A and George 21. If you are into aviation as much as I, you owe it to yourself to travel to the place where it all began. And what a perfect excuse for you to conveniently stop by the museum on your next vacation. The wife and kids will be so mesmerized by the experience, they will never know you did it for yourself! Moreover, you will provide an experience that none of them will ever forget.

My thanks to:

The United States Air Force Museum

Major General Charles D. Metcalf (Director)

Charles G. Worman (Curator)

And especially, Denise Bollinger (Media Relations & Marketing)



by **JEPPESEN**



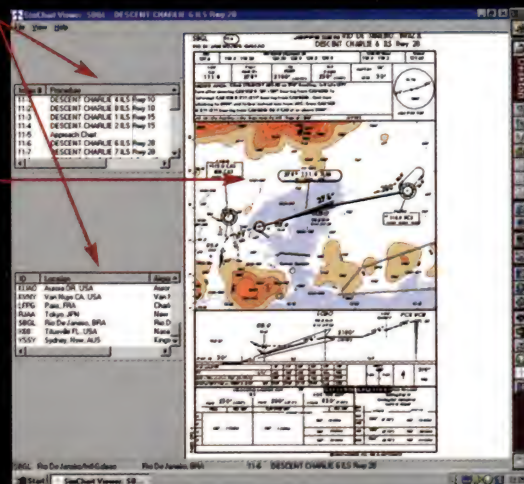
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Full Throttle listens to 3-D Sound Cards

For years Creative Labs SoundBlaster was the standard sound card for PC gaming and simulation enthusiasts. Then the SoundBlaster Pro surfaced with stereo sound, and not long after that the SoundBlaster 16 arrived with CD-quality sound. Before long, the AWE-32 with Wave Table sound support melded the technology of the SB16 with Wave Table sound, and MIDI in *Doom* and *US Navy Fighters* never sounded the same again. And in 1997 Creative Labs released the AWE-64 Gold, which disappointingly was nothing more than a redesigned AWE-32, with a software synthesizer enabling a total of 64 voice support. And it was still an ISA (Industry Standard Architecture) board, when other vendors like Diamond were shipping new PCI (Peripheral Component Interconnect) sound card solutions.

In the DOS days, getting your sound running with your favorite games and simulations required fumbling with sound card setup utilities during installation. Back then, SoundBlaster cards were by far the most compatible and easiest to get running without a hitch. Then Windows 95 arrived, and DirectX surfaced soon after. Direct Sound, which is part of DirectX, helped eliminate having to configure your sound card to enable sound in your favorite games and simulations. It also marked the end of Creative Labs' Sound Blaster standard. A PCI sound card is also more efficient than the older ISA sound cards, making one a much faster and less CPU-intensive piece of hardware than an ISA-based sound card.

Today, a few favorable options are worth looking into, especially if you are still running an ISA sound card. The latest technology contenders are Creative Labs and Aureal 3D. Aureal 3D's technology can be found in **Diamond's Monster Sound MX300**, **Xitel's Storm Platinum** and **Turtle Beach's Montego II** in the form of the

Vortex II audio processor. Actually, Aureal 3D has been in the 3-D positional sound card market longer than Creative Labs, because Creative Labs didn't surface with their PCI 3-D sound card until just last year. Aureal's Vortex II technology accelerates Direct Sound, Direct Sound 3D, Direct Music and their own proprietary APIs, A3D 1.0 and A3D 2.0. Creative Labs uses the EMU10K1 audio processor, which accelerates Direct Sound, Direct Sound 3D and EAX, their own 3-D sound API (Application Programming Interface).

A few more options are available too, like the **Sonic Storm Pro** from VideoLogic and Aztech's **PCI 368 DSP**. The Sonic Storm Pro uses the ESS Maestro-2E audio processor, which accelerates Direct Sound and Direct Sound 3D only. Aztech's board uses a VLSI audio processor called the Thunderbird. It offers support for Direct Sound, Direct Sound 3D and EAX compatibility through emulation. The Aztech card also features quad speaker output, something the VideoLogic card doesn't have. The Sonic Storm Pro does feature an S/PDIF connector, allowing you to connect it to a DAT recorder or a Dolby Digital home theatre system. However, neither of those cards is in the same league as the flagship products from Diamond, Creative Labs and Xitel.

Let's take an in-depth look at the major contenders from Creative Labs, Xitel and Diamond Multimedia.

Creative Labs: Sound Blaster Live!

At long last, Creative Labs debuted a PCI sound card of their own last year. The **Sound Blaster Live!** comes in two flavors: the high-end Sound Blaster Live! package or the SoundBlaster Live! Value Edition. The high-end version includes the Digital I/O (Input/Output) board, which doesn't require the use of another slot, but does require an open bracket space for installation. That and the price are the main differences between the two versions of the board.

Creative Labs claims that the EMU10K1 audio processor chip (the driving force behind the SB Live!) "Is the most powerful integrated music, audio and effects engine available." It can process signals at 32-bit, 48kHz using eight-point interpolation to smooth the sound, supposedly improving any audio source. This chip also provides real-time effects, including reverb, chorus, flanger, echo and pitch shifter. These effects can be used a number of different ways in games and



Product review and comparison by Rod White

Full Throttle Listens To 3-D Sound Cards

simulations by pre-setting these effects manually, creating your own sound field or by using the pre-set configurations they provide with the product.

The board supports multiple speakers, allowing you to use two speakers or four via the second output connector. The Digital I/O Audio Extension Card features a boatload of features and connectors for SPDIF compatible devices, a MIDI DIN connector and a Digital DIN connector for future expandability for connecting up to eight digital speakers.

The MIDI capabilities break the 64- and 128-voice barriers by offering a whopping 256-voice wave table synthesis, and they're claiming that with an update it will feature an amazing 512-voice capability. In hardware it only sports 64 voices. It can also store the samples in system RAM. So, you can allocate up to 32MB of system RAM for sample storage, if you have it to spare.

The included software bundle is not impressive. They provide you with a nice double jewel case containing three CDs. The first CD contains the software utilities and drivers for the hardware and Cakewalk Express Gold. The second CD features Mixman Studio, Sound Forge XP 4.0 and Unreal: Special Edition, which is not a full version of the game, just an enhanced demo with EAX support. The third CD contains SoundFont demos and samples, with a multimedia tour of the product.

Installing the board is not a chore, and using it as a Direct Sound 3D and Direct Sound board was a joy. When running Direct Sound or Direct Sound 3D titles, it's hard to tell the difference between this board and a Vortex II-driven solution. There's no denying that this board is packed full of bells and whistles, but you must ask yourself if you'll actually use them all. I don't think all of the pre-configured Environmental Audio settings and the ability to create your own sound field is a feature that gamers will really want or need. Sure, it's nice to have the option, but most gamers would rather just load up an EAX game and run it, instead of trying to change or screw up the sound of your favorite games that don't offer EAX support.

The ability to run any game with four speakers is one feature gamers will want to take advantage of. Being able to position the speakers properly and having the funds for a second set of quality multimedia speakers are the biggest dilemmas gamers face with this functionality. Diamond is no longer the only company that makes a quality PCI sound card that supports four speakers.

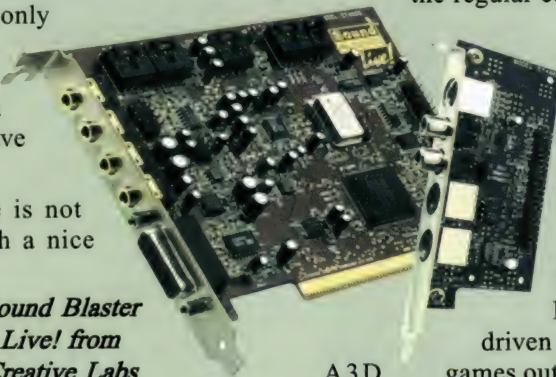
To sum up, the SoundBlaster Live! is an excellent all around PCI sound card, and it even features legacy support for DOS gaming. It looks like they looked at the market and

designed a sound card to please their musician customer base, while also creating a board that PC gaming enthusiasts can enjoy too. I really can't recommend the Sound Blaster Live! to PC gamers, because it costs almost \$100 more than the SB Live! Value Edition, which is almost identical to the regular edition in terms of gaming functionality, but it's more affordable at only \$99. I've found the Value Edition board selling for as low as \$79 in some places, so it's the wiser choice if you just want to take advantage of four-speaker support and EAX games. If you are a serious musician who feels there is a need for the Digital I/O Expansion Card, or if you'd like to take advantage of the SPDIF connectors in some way, then the regular edition is the board you want.

Best of all, an EAX game is not required to take advantage of the four-speaker support. You can enjoy running *Falcon 4.0*, *European Air War*, *WWII Fighters*, and all of your other favorite Direct Sound and Direct Sound 3D games and simulations while being surrounded by true four-speaker sound. It's hard to say that the Sound Blaster Live! is better than an A3D Vortex II-

driven product, because there is currently more A3D games out there than there are EAX ones, but I can say that the Sound Blaster Live! is a great PCI sound card worthy of the SoundBlaster title.

*Sound Blaster
Live! from
Creative Labs*



Diamond Multimedia: Monster Sound MX300

The first Vortex II product to hit the streets was Diamond's **Monster Sound MX300**. As a matter of fact, Diamond has been ahead of the competition for years now when it comes to PCI sound cards. Their first generation Monster Sound was one of the first, if not the first PCI sound card with A3D support on the market. The problem was that there weren't very many Direct Sound 3D and A3D titles out there to let the card really shine, but it was the first PCI sound card to feature four speaker outputs, allowing you to hook two sets of multimedia speakers up to your PC.

The Monster Sound MX300 is the fourth Monster Sound product from Diamond. The Vortex II audio processor supports up to 76 Direct Sound 3D streams of audio in hardware, and



Full Throttle Listens To 3-D Sound Cards

features a 320-voice Wave Table synthesizer, a 10-band graphic equalizer, Quad speaker support, DOS sound support and, like the Sound Blaster Live!, a variety of different effects can be toggled on or off.

The software bundle is also impressive, but Diamond always did put together a nice software bundle. Utilities you get include the *Zoran Software DVD player*,

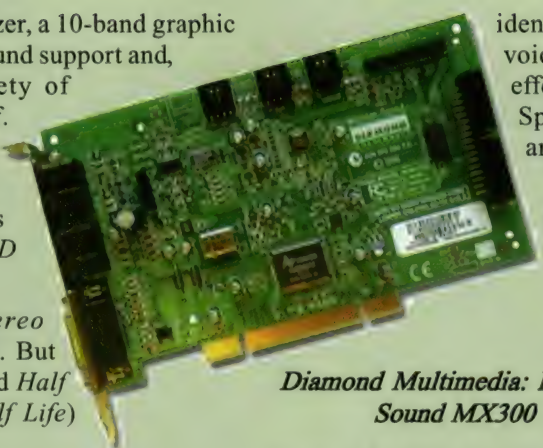
Music Match MP3 Jukebox, *Stereo Recording Session* and *Media Works 98*. But that's not all. A full version of *Recoil* and *Half Life Day One* (the demo version of *Half Life*) are also part of the bundle.

The board itself offers hardware acceleration for Direct Sound, Direct Sound 3D, A3D 1.0 and A3D 2.0 games and simulations. What makes the board so great is that a bunch of A3D 1.0 games are out there, like *Heavy Gear*, *Dark Forces II: Jedi Knight*, *Outlaws*, *Descent: Freespace*, *Heretic II*, *Tribes*, and *Starsiege*, just to name a few. And A3D 2.0 titles like *Half Life* will have you peering around the corner late at night when playing alone in a darkened room. The Quad Speaker support is also impressive, and if you enjoy simulation titles like *Longbow 2*, *WW II Fighters*, *European Air War*, *Falcon 4.0*, *Delta Force*, *Rainbow Six* or just about any other Direct Sound title, the experience will come to life all around you in a way that two speakers alone can not reproduce.

The Monster Sound MX300 is clearly one of the best PCI sound cards money can buy, because it offers a lot of support and far more A3D games are on the shelves than ones with EAX support. The Quad Speaker support and the 10-band EQ also make it one of the best sounding cards out there. Diamond also plans to release an expansion card with many of the features that the Sound Blaster Live!'s Digital I/O card offers, so if you need those capabilities, it will be an option you can pursue. The \$99 price-point also makes it a very attractive option, because Diamond does toss in a nice software bundle, which is something Creative Labs is seriously lacking.

Xitel: Storm Platinum

Xitel is a small company from down-under (Australia) that makes great PCI sound cards. Many of you won't be familiar with their name, because most of their business has been conducted online, but it goes to show that you don't need the marketing dollars and retail channel muscle of Diamond or Creative Labs to bring a good product to the masses. The **Storm Platinum** is a Vortex II-based product, making it very much like the Diamond Monster Sound MX300 in terms of capabilities. There's really nothing this card can't do that the MX300 can. All of the specifications are almost



Diamond Multimedia: Monster Sound MX300

identical as well, because it too offers 320-voice Wave Table sound, eight real-time effects like echo, reverb and chorus, Quad Speaker output, DOS gaming support and a 10-band graphic EQ.

What it does have that the MX300 doesn't is an Optical S/PDIF Output (TOSLINK). With this you can connect your PC to a DAT recorder or a Dolby Digital home theater receiver. Unfortunately, there is no software bundle to speak of aside from a demo disk from Aureal. Fortunately, the

price of the board reflects the lack of a software bundle, because the Storm Platinum can be purchased for only \$79, which is almost \$20 less than a \$99 Diamond Monster Sound MX300.

Xitel also offers what they call a Gamer's Pack, which includes the board as described above and a set of force-feedback headphones. The headphones are unique, because they vibrate to sound. In titles like *Quake 2*, *WWII Fighters*, *Half Life*, *European Air War* and *Apache Havoc*, the headphones were a real kick in the pants to use. An in-line volume control and an on/off switch for the force-feedback effects are also integrated. The headphones offer a good sound quality, and AAA batteries for the unit are also included. As you can see, no matter which package you choose, the Storm Platinum is an excellent value. As a side note, Xitel claims they may offer a driver update for EAX support too, which would make the Storm Platinum by far the most compatible PCI 3-D sound card on the market.

Conclusion

There you have it. If you are in the market for a new sound card, any of the three we reviewed above are worth picking up. It all depends on which features you are looking for, what software you'd like to get, if any, and what you are willing to pay to play.

We invite you to visit the Websites of these manufacturers before making any buying decisions.

Creative Labs

<http://www.creativelabs.com>

Diamond Multimedia

<http://www.diamondmm.com>

Xitel

<http://www.xitel.com>

Round Robin Adventure #7

By Al Pelletier

Welcome to the seventh Round Robin (RR) written for *Full Throttle* magazine.

This one takes place in the Balearic Islands of Spain in the Mediterranean Sea. Just imagine yourself taking a DC 10, MD 11 or Boeing 737 full of passengers to their vacation destination. I flew it with Microsoft *Flight Simulator 98* and some freeware add-on scenery. It can be flown with any flight sim that has the required airports and nav aids.

We will begin at Barcelona (Spain) airport, then transit to three of the islands and return to Barcelona airport. The highlight is an ILS approach at Ibiza in early morning fog and low visibility.

The Round Robins use "real world" navigation

I flew this Round Robin using Microsoft's default FS98 scenery and **BALEA99.ZIP**, by Toni Agramont. It can also be flown with any simulators that have the required nav aids and airports. I flew a DC 10 on this trip, which is best suited for a medium/heavy jet. If you have flown previous RRs, skip the next paragraph, jump right in, and have fun!

For those who are new to this, Round Robins are published so flight simmers can look at the scenery, refresh knowledge of Geography, practice cross-country navigation, fly approaches at different airports all over the world and have some fun.

In the RR, you will be getting information like: airport departure and runway number, VORs and ADFs enroute, two or three middle airport destinations (for VFR or instrument approach) and instructions leading you back to your point of departure

(hence, a "Round Robin"). You will also be given ILS and LOM frequencies, minimums, procedures, etc. You will get information on the scenery needed to complete the flight and where to get it, who created the scenery and a little background on the geography of the area. After you do a few of these, you will have a much better command and understanding of the different types of published procedures. You will learn to handle a lot of information in a very short time, while still maintaining control of your aircraft.

I also suggest that you read the entire route before starting out, so that you'll have the flight plan fairly clear in your mind.

Scenery required

Microsoft default scenery with the Europe boosters active. Also, **BALEAR99.ZIP** and **BALCHIPS.ZIP**. You can retrieve these files from the Internet at <http://wings.ark.com>. Go to the "Files" section and click on the "Full Throttle Magazine Round Robins FTP Section." You will find the files listed there.

Other scenery that will work are: **BALBGL.ZIP** for FS5 (by Juan Cabeza)

BALEA95.ZIP and **BAL98EXL.ZIP** (by Bert Viersta and Juan Cabeza)

SPAIN.ZIP (by Pedro Aviles)

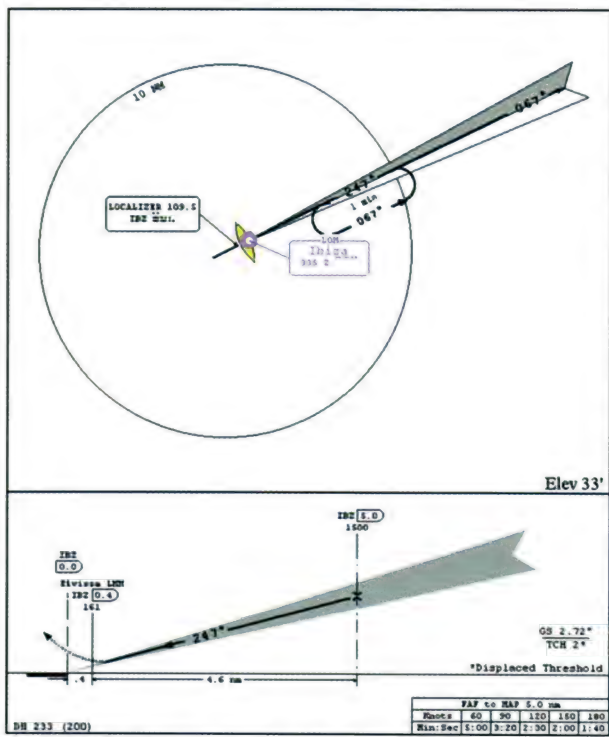
All are available at:

<ftp://wings.ark.com/pub/fullthrottle/RoundRobins/>.

Route For The 7th Round Robin (RR)

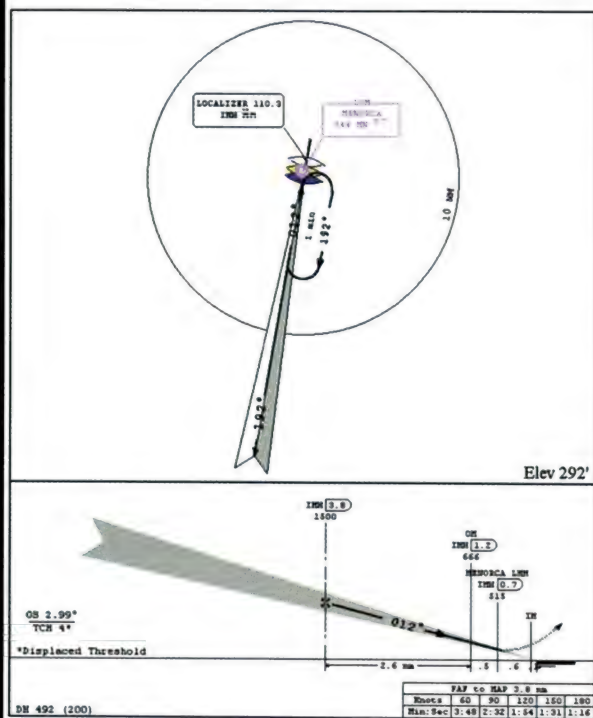
Barcelona Spain (LEBL) to IBIZA (LEIB) to Palma De Mallorca (LESJ) to Menorca (LEMH) to Barcelona.

ILS/DME Rwy 24
Ibiza International



Approach plate for Palma de Mallorca

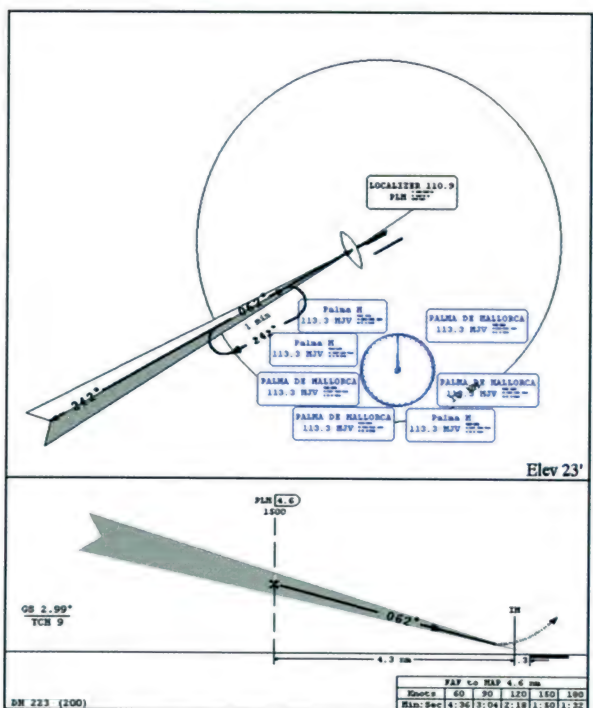
ILS/DME Rwy 1
Menorca Intl. Rwy 01



Approach plate for Menorca

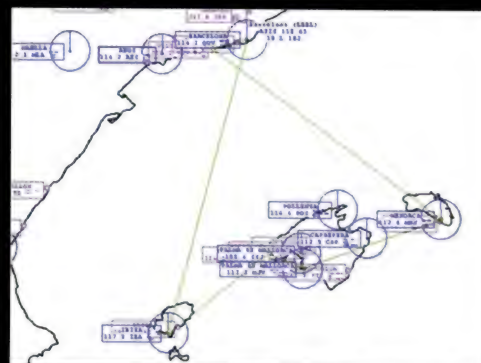
Maps and Charts For Round Robin #7

ILS/DME Rwy 6L
Mallorca Son Sant Joan Rwy 24R



Approach plate for Ibiza

CoPilot navigational chart for Round Robin 7 (top right) and a map of the geographic area for Round Robin 7 (bottom right).



A Balaeric Vacation Round Robin Adventure



DC 10 climbing out at Palma de Mallorca

First Leg

From: Barcelona Spain (LEBL)

To: IBIZA (LEIB)

Distance: Approximately 147 nm

- ✈ Set your FS clock to 06:00, season: summer, weather: few clouds, visibility: 1.5nm (to simulate fog), winds: calm.
- ✈ Select RWY 25 at Barcelona.
- ✈ Dial in the Barcelona VOR (QUV) 114.3 on NAV 1, the IBIZA VOR (IBA) 117.8 on NAV 2 and the IBIZA NDB (IBZ) 394 on your ADF.
- ✈ Take-off with a left, climbing turn to 1,1000, HDG (heading) 190°, and remain on the 190 radial of the QUV VOR, until reception of the IBIZA VOR (approximately 40nm out of Barcelona). Track the Ibiza (IBA) VOR on reception.
- ✈ 32nm from IBIZA, turn slightly left and home the IBZ NDB to begin descending to 4,000.
- ✈ Set the IBIZA Localizer (IBZ) 109.5 and 244 on your Nav 1 OBI, in preparation for an ILS to RWY 24 (actual course: 244°, elevation: 23, RWY length: 9,180).
- ✈ Over the IBZ NDB, continue for one mile, then turn left to HDG 064° and descend to 2,000. Maintain this HDG until nine miles DME, then turn left to HDG 290° to intercept the LOC, and continue with the approach.
- ✈ Five nm back, you are cleared for landing at Ibiza RWY24. Check that your gear is down.

LAND IBIZA

Second Leg

From: IBIZA (LEIB)

To: Palma de Mallorca (LESJ)

Distance: Approximately 80 nm

- ✈ Set your FS clock to 08:30. Weather: the fog is lifting and it is now ceiling and visibility unlimited.
- ✈ After unloading and taking on passengers at the terminal, taxi to RWY 24.
- ✈ Dial in the Palma VOR (SSJ) 117.7 and the Andraitx NDB (ADX) 384.
- ✈ Take-off from RWY 24, climb and maintain runway heading to 2,000, then turn right to HDG 058° and continue climbing to 9,000. Enroute, dial in the localizer (PLM) 110.9 and set course 061° on your OBI in preparation for an ILS/DME to RWY 06L at Palma (actual course: 061°, elevation: 32, RWY length: 10,728).
- ✈ 35nm from the SSJ VOR, turn left and descend to 2,600. Home the ADX NDB to on top.
- ✈ On top ADX, turn right HDG 146°, continue descending to 1,900 and intercept the LOC (about a five nm run and a very sharp 90-degree left turn to intercept the LOC).
- ✈ Five nm back, you are cleared landing on RWY 06L at Palma de Mallorca. Check to be sure your gear is down.

LAND Palma



Final approach, Palma de Mallorca



A Balaeric Vacation Round Robin Adventure

Third Leg

From: Palma de Mallorca (LESJ)

To: Menorca (LEMH)

Distance: Approximately 72 nm

- ✈ Set the FS clock to 11:00 am.
- ✈ After your stop at the terminal, taxi to RWY06R.
- ✈ Dial in the Menorca VOR (MHN) 112.6.
- ✈ Take-off with a right, climbing turn to 7,000, HDG 080°, and track the MHN VOR.
- ✈ We will do a visual approach at Menorca (for a change). For those who wish to do an ILS, the LOC frequency is 110.3 and the course is 010°.
- ✈ 20nm from the airport, begin a descent to 2,500. Overfly the airport at mid field, then turn right HDG 180° (maintain for at least two minutes) to join down wind for a visual approach to RWY 01 (actual course: 015°, elevation: 297, RWY length: 7,710). (With the BALEA99.ZIP, the airport will look like it is sitting in water as you approach from the west, but will look OK from any other angle).
- ✈ Five nm back, you are cleared for landing on RWY 01. Be sure your gear is down.

LAND Menorca



Final approach to Menorca

Fourth Leg

From: Menorca (LEMH)

To: Barcelona approximately

Distance: Approximately 157 nm

- ✈ Set FS clock to 14:00.
- ✈ Dial in the Menorca VOR (MHN) 112.6 on NAV1 and the Barcelona VOR (QUV) 114.3 on NAV2, along with the Villaneuva NDB 380 on your ADF.
- ✈ Taxi to and take-off from RWY 01 with a left, climbing turn to 14,000, HDG 313°. Remain on the 313 radial of the MHN VOR until reception of the Barcelona VOR.
- ✈ Track the Barcelona VOR on reception, dial in the LOC 110.3 and set 068 on your OBI in preparation for an ILS (no DME) to RWY 07 (actual course: 068°, elevation: 13, RWY length: 10,197).
- ✈ 30nm out of the Barcelona VOR, turn left, homing the Villaneuva NDB to on top and begin descending to 7,000.
- ✈ On top Villaneuva, descend to 5,000, maintain HDG for 45 seconds, then turn left HDG 106° and intercept the LOC and continue with the approach.
- ✈ You are cleared to land RWY 07 for a full stop. Ensure that the gear is down.

LAND Barcelona

Welcome home!

Many thanks to Chris Squire for test flying the route. Chris is a retired military pilot with over 12,000 hours of flying.

Visit Al Pelletier and his crew at:

apeltier@mars.ark.com

<http://mars.ark.com/~apeltier>



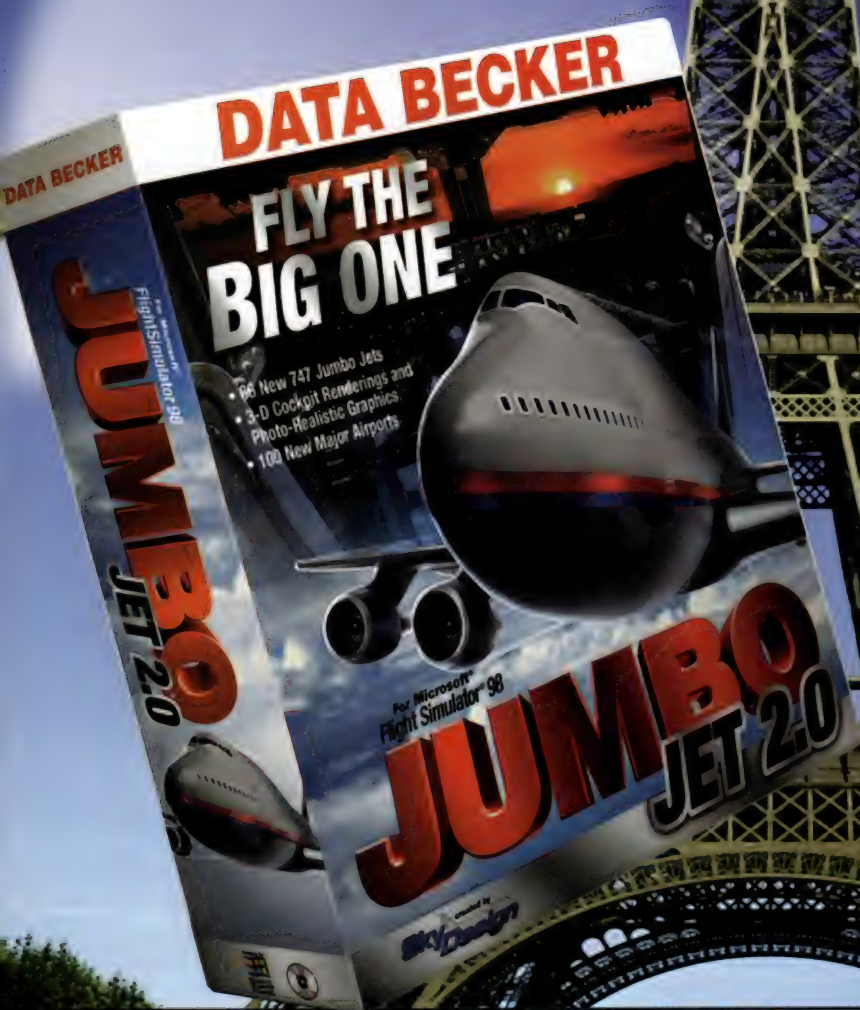
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How I Make Scenery

By Justin Tyme

Creating Photoreal Elevated-mesh Terrain Using ASD 2.0, USGS DOQ Images & Paint Shop Pro

The imminent release of ASD 2.0 heralds an exciting new world for scenery designers and end-users. ASD 2.0's new features open the once-esoteric realm of elevated-mesh terrain to the masses. The formerly tedious, time-consuming manual coding process can now be accomplished with the click of a few buttons, and we will no doubt be seeing topographically accurate, visually stunning scenery from designers all over the world in the coming months.

Over the past several weeks I have been toiling in a trial-and-error process working out methods for applying photoreal textures to ASD 2.0's elevated-mesh terrain. There have been many fits and starts, and much work was discarded and restarted while breaking this new ground. Finally, after a considerable amount of hair pulling, pondering, scouring the Internet and figuring things out, I arrived at a method that works. In this article I will share these procedures with hope that you can avoid the land mines that I've stepped on during my experimentation. Keep in mind that these procedures are still evolving, and I don't claim that these are the *only* methods, only the methods that I have worked out during many weeks of exploring the possibilities.

We'll be using relatively inexpensive software and a fairly comprehensive source of U.S. aerial photographs freely available over the Internet, so these methods should be within financial reach of anyone interested in scenery design. You'll also need a good working knowledge of the use of Abacus' Airport & Scenery Designer & Jasc's Paint Shop Pro.

Tools required

First, we'll need Abacus' Airport & Scenery Designer version 2.0. We'll also need a graphics program to process the aerial photos. One of the more popular and reasonably priced programs is Jasc's Paint Shop Pro 5. Jasc offers a free 30-day evaluation version for download at <http://www.jasc.com>. Optionally, but highly recommended, is Jasc's Image Robot,

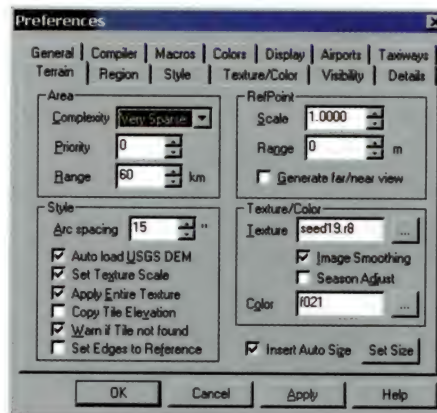
also available as a free, 30-day evaluation version from the same location. Image Robot will speed things up considerably by allowing you create a script that will automate much of what we will be doing here. Finally, we'll need to go to

http://edcwww.cr.usgs.gov/nsdi/doq_qq/ph1crit.htm

to obtain the aerial photographs that we'll be using to create our photoreal textures.

Setting up ASD v. 2.0

The following assumes that you have already gone to the USGS Web site noted in the ASD's Help system and downloaded the DEM terrain data required for the area you're working. It also assumes that you have prepared the other elements of your map, such as synthetic tiles, by adjusting the elevation of all tiles to one consistent elevation, probably zero. Refer to Tim Dickens' article on elevated-mesh terrain elsewhere in this issue.



The first step is to configure the ASD Global Preferences for use of photoreal textures.

Pull down the **File** menu and choose **Preferences**.

Click the *Terrain* tab.

In the Style box, make sure *Apply Entire Texture* is checked, and set your resolution to 15 arc-seconds.

Make sure *Insert Auto Size* is checked, then click the **Set Size** button to set the size of your terrain to 225 x 255 arc-seconds. This corresponds to the 3.75-minute Digital Orthographic Quarter Quadrangle (DOQQ) images we'll be using and will facilitate accurate placement of the features from the photographs. At this stage the default texture is not important, since we will be changing it later.

Placing the terrain grids

Open your map (*.scb) file. Make sure you have unzipped the proper USGS terrain data files into a folder and configured the proper path under **Edit | Map Properties, Map** tab. *This is important:* Each DEM file has specific boundaries, and for this procedure to work, you must first determine these boundaries by aligning the edges of your terrain grids *exactly* with these boundaries.

Let's say the area in which you are working covers part or all of four different DEMs. You should place your first terrain grids at the intersection of these four DEMs and work from there. As of this writing, the beta copy of ASD that I've been testing doesn't have a graphical representation of the DEM boundaries (we hope this is included in the final public version). So, the only way to determine the boundaries is to place your terrain grid as close to a boundary as you can, then move it in small increments until you find the boundary. You'll want, for instance, the north and east edges of the terrain grid to align perfectly with the northern and eastern boundaries of the DEM. ASD will give you an error message if any part of the terrain grid is not completely within the DEM boundary. Just keep moving it in small increments until you nail the boundaries and don't get the error message. With practice and patience this is not a difficult chore. Once you find the boundaries for one grid, place another grid adjacent to it. The western edge of this new grid should align perfectly with the western boundary of this adjacent DEM. When you have nailed the boundary, both grids will "snap to," each in their respective DEMs with no error dialogs.

Now we have the east/west boundary (aligned north and south) of two of the DEMs. We must now find the north/south boundary (aligned east and west) of the other two DEMs. So place two other terrain grids north of the two we just placed and move them in small increments until the south edge of these grids matches the southern boundary of these DEMs. The object here is to make the edges of the four grids intersect at the precise intersection of the four DEMs. It's probably a good idea at this point to save and compile and have a look at your work in FS, just to make sure the grids are placed correctly and that there are no spikes or other anomalies along your grid

boundaries. If you find an unusual appearance, the grids may need to be adjusted a notch. The grids will "snap to" in 3 arc-second increments, and it is possible to have the edges one increment off without receiving an error message. A small adjustment will usually solve the problem.

Once these first four grids are properly placed, you can fill in the rest of your terrain grids using these first four as a reference and ensuring that all adjacent grids "snap to" so no gaps or overlaps exist. Coincidentally, when using 255 arc-second square terrain grids, they will fit precisely within each DEM file, making for a seamless expanse of terrain covering several DEMs. Each DEM file will contain 16 rows and 16 columns of 225x 225 arc-second terrain grids—256 terrain grids total. Further, at 15 arc-second resolution, each terrain grid will contain 256 elevation points. This is a good compromise between detail and frame rates. At the highest resolution, 3 arc-seconds, each terrain grid will contain almost 6,000 elevation points—enough to bring the fastest processor to its knees. So, 15 arc-seconds works well, allowing adequate frame rates.

Obtaining the aerial photographs

Now that we have determined the precise DEM boundaries and thus have our terrain grids positioned properly, we are ready to go get some aerial photographs. The USGS calls these aerial photographs "Digital Orthographic Quadrangles" (DOQs), and they cover 7.5 minutes of latitude and longitude. Each DOQ is further subdivided into four images. Each image is called a "Quarter Quadrangle." The individual images are called "Digital Orthographic Quarter Quadrangles" (DOQQs), and each DOQQ will correspond to one 225 x 225 terrain grid.

So, let's go get some aerial photos. Open your browser to the USGS URL mentioned earlier in this article. There you will find a search function asking you to input either one pair of lat/long coordinates (if you are looking for one particular image) or two pairs, if you want all the images in a geographical range. It's best to confine your search to no more than 10 or 20 minutes, else the search will return too many entries.

For our example, I'll do a small area of northeastern Pennsylvania near Franklin, which is part of my PANJ9x project. Using ASD, I'll put my mouse cursor over Venango Regional Airport and write down the lat/long coordinates: 41d22m and 79d51m. At the



For example: -DD MM

- Longitude format uses a minus sign for western hemisphere. E

For example: -DDD MM

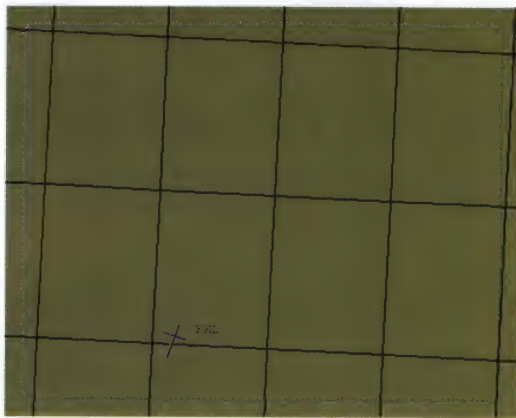
- Dataset coverage is United States.

Point 1-- Latitude: Longitude:

Point 2-- Latitude: Longitude:

Dataset collection and inventory metadata will both be queried using link in the returned collection metadata. This link includes an orderin

USGS search page, I'll plug in four coordinates as shown in figure two. Clicking the **Submit** button takes me to a listing of all the DOQQs within that geographical range. This search returned 44 images. Scrolling down I find the Franklin DOQ, which consists of four images, Franklin NE, SE, NW and SW. Each entry gives the associated metadata about the images and has a Preview link at the bottom of each entry. Write down the lat/long boundaries of the images, which we'll use later when we're cropping our mosaic. Click the Preview link for Franklin SW. When the image loads, you will see the town of Franklin, as well as Venango Regional Airport at the southwest part of the image. Notice how this location corresponds precisely with the position of Venango Regional on the corresponding terrain grid in ASD, as shown in figure three.



Right-click on the image and choose **Save Image As**, name it FRANKLSW.BMP and save it to your hard drive. An alternative method of downloading is to right-click on the Preview link and choose **Save Target As**. This allows you to save the image as a .JPG file and save some disk space, since .JPG images are usually much smaller than .BMP files. Save all four files to your hard drive.

A quick note about DOQQs

These preview images are not the actual DOQQs. The actual DOQQs are over 40 MB each in one-meter resolution, and they cost \$7.50 each. You can order a custom-made CDROM from the USGS to obtain the actual DOQQs. Also, several university FTP sites have the real DOQQs for free download, but unless you have a cable modem and lots of disk space, you'll probably prefer to use these free preview images. Mapped to a 225 x 225 terrain grid, the preview images will provide, according to my rough calculation, about 25-meter resolution. This will provide a mushy appearance from all but the highest altitudes. Later in this article I will show you how we can use these images to obtain about 6-meter resolution, which is more than adequate for our purposes.

Using Paint Shop Pro to process the images

Setting Up

The following assumes that you have already set up Paint Shop Pro according to Tim Dickens' article in the Feb/Mar 1999 issue. Setting up per Tim's instructions speeds up the process considerably. If you haven't already done so, I recommend you refer to Tim's article now and set up PSP accordingly before proceeding any further.

Now here's my own further customization. Pull down the **File** menu and choose **Preferences | Customize Toolbar**. Add a separator after the last icon, then add the following buttons: Copy, Paste As New Image, Flip, Resize and Save As. Add another separator, then add Paste as Floating Selection. We'll be using these buttons extensively.

Initial Adjustments

Now open the four images and zoom out until all four fit within the work area. Depending on your screen resolution, this will generally be 1:4 or 1:5 size. Move them to their proper positions: the NW photo goes to the upper left, NE to upper right, etc. You notice two things immediately. One, most likely the four images will be inconsistent in brightness

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and contrast. Secondly, you'll notice some overlap. The first can be a problem. The second is no problem, as we will be pasting these four images together into a mosaic anyway.

One advantage of the higher-end graphics programs such as Adobe Photoshop, Corel PhotoPaint and others, is that they offer more versatility and precision when dealing with these tonal issues. With Paint Shop Pro it seems you must rely more on your eye. Also, the brightness/contrast adjustment in PSP is a bit convoluted, but maybe that's just because I am not a graphics guru. (I sort of bumble my way through and learn as I go.)

In any case, pull down the **View** menu and choose **Toolbars**. Make sure *Histogram Window* is checked. You can use the histogram to help with your adjustments. You can experiment with the various adjustments under the **Color | Adjust** menu. Play with the brightness and contrast, and notice how they affect the histogram. The goal is get all four images as similar as possible in brightness and contrast, as this will have an effect later when we are doing the color replacement. Again, with Paint Shop Pro, your eye is the best judge. If you apply an effect and don't like it, you can always use the undo feature. Just fiddle with the images until they look as equalized as possible. With practice you can develop a good feel and sharpen your eye to these issues.

Speaking of equalization, an entry in the **Color** menu is called **Histogram Functions**. I've not had good success with PSP's **Equalize** command. It seems too severe and there seems no way to adjust its settings. You can try it and see what success you might have, but I've not found it to be of much use.

I generally keep an eye on the Average value in the Histogram window. If you can get all four images to have the same average value, you are probably as close as you can get to equalizing the images. In short, trust your eye. Put the images side by side, and with the help of the histogram, adjust them until they all look like they're together.

Of course, there will be occasions when all four images are already in good shape and no adjustments are necessary.

Pasting the Images into a Mosaic

Once the images are equalized, we will paste the four Quarter Quads into one Quadrangle. I usually begin by selecting the NW quarter quad. Pull down the **Image** menu and choose **Canvas Size...** At this point we want to at least double the size of the canvas, maybe a little more. So, let's make the width about 1,600 pixels and the height about 2,000 pixels. This will give us plenty of room to work. We also want to keep the NW image in the northwest of the canvas, so in the Image Placement box, we want the top and left values to be zero. Just tab down to the Top box and insert a zero. PSP will calculate the Bottom value automatically. Tab down to the Left

box and insert zero. PSP will calculate the Right value automatically. Make sure the Center boxes are not checked. Click **OK**.

We now have an enlarged canvas with the NW quarter quad in the upper left of the canvas. We will now paste the remaining three images into this image to form a mosaic. I've discovered that these images usually have a one- or two-pixel "border," for lack of a better term, that will create a very noticeable line in the final image if we don't crop it out. The easiest way to do this is to use the **Canvas Size** command again on the remaining three images. Select the NE Quarter Quad, pull down the **Image** menu and choose **Canvas Size...** again. We want to chop a few pixels off each side of the image to eliminate the "border." In the Canvas Size dialog box, note the size of the existing image and subtract about ten pixels off both dimensions. Now we want to check both the *Center Image Horizontally* and *Center Image Vertically* boxes. Click **OK**, and the image will be cropped enough to get rid of the border.

After resizing the canvas in this manner, click the Copy toolbar button. Now select the NW image (with the big canvas) and click the Paste As Transparent Selection toolbar button. The NW image is now under your mouse cursor and you can move it into position to the right of the NW image. Click the left mouse button and zoom way in on the image. Use the **Shift** + arrow keys to fine-tune the placement of the NE image against the NW image, making sure the roads, rivers and other features match up precisely. Remember, there is some overlap to these images. Once the images match up precisely along their edges, select the SW image and repeat the process. Then select the SE image and paste it together with the other three.

Cropping the image

We now have almost completed the Franklin, PA Quadrangle. But if we are to be precise, and photoreal terrain demands precision unless we want our rivers flowing up the sides of hills, we must now crop the image as close as possible to its published lat/long boundaries. I've not found any quick and simple way to do this other than using a good map program, such as Delorme Street Atlas, or some other atlas with a precise grid of lat/long coordinates to match up with the features in the quadrangle in order to determine where the image must be cropped. We must manually determine at least two of the cropping locations. Mathematics can then be used to extrapolate the other two. However, I'm not much of a mathematician, so I usually just use the map source to determine all four cropping locations.

Without getting into the esoterics of geocoordinate systems, since that's way over my head anyway, in general a 225 x 225 arc-second area is only a perfect square at the equator. The further from the equator one goes, the more elongated the area becomes in the north/south axis. The extreme high latitudes could present a real problem for arctic and antarctic scenery designers, and those special cases are beyond

the scope of this article, so I won't even attempt to touch them. But in general, the elongation of the north/south axis is roughly equal to the cosign of the latitude. We can use this formula to extrapolate (or is it interpolate?) the final dimensions of our Quadrangle.

So, referring to a good map source, find an easily discernible landmark—an intersection, a lake, the bend in a road, whatever, that corresponds to the published western boundary of the western Quarter Quads. Now find that same landmark on the image and make your western crop at the location. Do the same for the northern boundary and for the eastern boundary. To determine the southern boundary, you may either use the map or use the latitude cosign formula. Take the cosign of the latitude of the center of the image. This value will become the aspect ratio of the resized canvas. In other words, once you have made your western, northern and eastern crops, pull down the **Image** menu and choose **Canvas Size...** In the case of the Franklin Quadrangle, the latitude of the center of the image is 41.4375. Using a scientific calculator, we find that the cosign of this value is .7496. After cropping, the resulting image is 1,315 pixels wide. 1,315 divided by .7496 is 1,754. This is the height the image should be in pixels.

We now have a properly cropped image of the Franklin Quadrangle, which corresponds precisely to four 225 x 255 arc-second terrain grids in ASD. Before going any further, let's save the image as **FRANKLIN.BMP**.

That concludes the "scientific" portion of our procedure. We will now become artists.

Colorizing the images

Apply the FS Palette

The first thing we want to do is apply the FS palette. Pull down the **Colors** menu and choose **Load Palette...** Find your FS palette file, select *Nearest Color Matching*, and click **Open**. The result will produce between 30 and 35 different shades of gray in the image. Our task now is to replace most of these shades of gray with various shades of greens and browns. Some of the grays, representing highways, parking lots, etc., will remain as they are.

First Pass Global Color Replacement

Generally, the top row of grays on the palette will be replaced with darker shades of brown. Since the Franklin DOQ represents, essentially, forest and farmland, we will be replacing the top palette row of grays with the darker greens.

I recommend using the Jasc Image Robot for these darker shades. Using Image Robot, you can automate this procedure with a script that considerably speeds the process and also will produce more consistency in the color replacement. Or you can do it manually with the same results, it just takes longer.

Let's walk through the manual procedure here, then if you wish you could automate it with Image Robot for subsequent DOQs. On the right side of the PSP workspace you will see the Color Palette. If you don't see the Color Palette, click the Color Palette button on the toolbar. On the Color Palette you will see two squares, one behind the other and offset to the bottom right. The square behind is the existing color, the one in front is the new color. Somewhere in your workspace you will also see a Tool Palette. You can undock this and move it around to your preference. On this Tool Palette you will find the Color Replacer tool. Click the Color Replacer button, then click the lower/behind square on the Color Palette. The FS palette we loaded will appear. Click the darkest color in the top left. The lower/behind square will become that color. This is the color we will be replacing. Now click the upper/front square. Again, you will see the FS palette. Click the darkest green square (palette index 44; R:5, G:21, B:5). This is the new color. Now double-click anywhere in the image. All pixels that are the color of the lower/behind square will be changed to the color of the upper/front square.

Now repeat the procedure, moving across the top row of the FS palette, replacing the progressively lightening grays with progressively lightening greens. There are essentially eight darker shades of green that we will be using on this top row of grays. We will be using the four darkest shades of "green" green and the four darkest shades of "olive" green. We have 16 shades of gray to replace with eight shades of green and olive, so I generally replace two shades of gray with the same shade of green, alternating between the "green" green and the "olive" green, until the darkest 16 shades of gray are replaced with the eight darkest shades of greens. The following table can act as a guideline:

Original Index	Replace with	Original Index	Replace with
0	44	8	46
1	44	9	46
2	104	10	106
3	104	11	106
4	45	12	47
5	45	13	47
6	105	14	107
7	105	15	107

Feel free to fudge these numbers and experiment to achieve the effect you want, but this is a good place to start.

The results of this first pass of color replacement are shown in figures four and five. This first pass can be automated with Image Robot so you can quickly go from the original cropped



DOQ to this next phase, where we will use the Selection Tool with the Color Replacer to refine our colorization with the lighter shades of greens and browns.

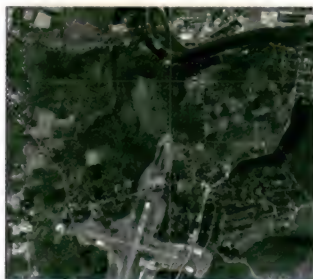


Refining Color Replacement using the Selection Tool

Here's where we get to the real artwork. Since these lighter grays can represent many different types of features, we must manually select the areas we want to replace and apply differing color schemes according to the type of feature in the image. For instance, farmland will have more browns, representing plowed fields; suburban areas will have more light greens, representing lawns or golf courses; downtown areas will retain most of their grays, representing concrete and asphalt, as will the roads and highways. Rivers and lakes, of course, will be more bluish-green. We can also retain the original cropped DOQ image and use different color schemes on them to create seasonal textures. Winter will obviously have more browns than greens, as well as more light grays and white to represent snow. Spring may have some lighter greens or more browns, representing freshly plowed fields. These freshly plowed fields may become lighter browns or yellows in the case of wheat fields, or greens in the case of summer hay fields. During the fall we can apply more reds and oranges to represent the changing leaves.

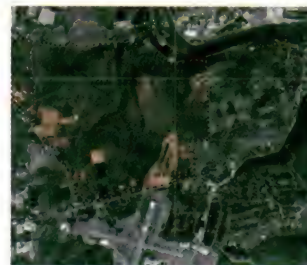
The Color Replacer tool works the same way as the various selection tools, except that it only affects the area selected. So, this next phase of the process involves selecting specific areas of the DOQ and applying specific color schemes to them.

Let's take an area in the Franklin DOQ just north of the airport, as shown in figure six.



Zoom way in on the image and click the Freehand selection tool. On the Tool Control palette, make sure you have "Point to Point" as the Selection Type. Outline the area as shown in figure six. We can now use the Color Replacer tool as we did before, but now it will affect only the area selected. Click the bottom/behind square on the Color palette and choose the first gray on the second row (we have already changed the first row). Click the top/front square and choose palette index 90 (a brown). Click the Color Replacer button and double-click in the selected area. All pixels within the selected area of the color specified on the bottom/behind square are changed to the color specified on the top/front square. Now click the bottom/behind square and move to the next gray on the second row. Then click the top/front square and choose the next lighter brown on the palette. Double-click within the selected area to apply that color.

All those grays have been replaced with the lighter brown. Do this down through the lighter grays and lighter browns until all pixels in the selected area have been replaced. One exception might be the whitest pixels, which probably represent houses or buildings. You can either leave these pixels alone or perhaps color them a non-earth tone for some variety. The result of this operation is shown in figure seven.



Follow this procedure through every area of the DOQ, applying the appropriate color schemes to the type of features the area represents. Keep in mind while doing color replacement that FS tends to display the colors brighter than they will appear on the DOQ in PSP. So, it's probably best to color your DOQ a bit on the darker side and be judicious with the lighter tones. As always, feel free to experiment with different schemes to achieve the effect you want. And as always, keep a backup in case something goes wrong. And save early and often. You never know when your system could come crashing down, wiping out hours of meticulous work.

Dividing the DOQ into FS textures

Now that we have processed and colorized our DOQ image, we are ready to slice the image into textures for use in ASD and ultimately in Flight Simulator. As I mentioned earlier, if we use one DOQ per 225 x 225 terrain grid, we will achieve an approximate resolution of 25 meters/pixel. In most instances this is unacceptable, resulting in a mushy appearance. The work-around for this is to chop our DOQ into 36 different

sections and reduce the size of our terrain grids from 225 x 225 to 75 x 75 arc-seconds. We are essentially creating nine new 75 x 75 arc-second terrain grids out of one 225 x 225 grid. This will result in a much more acceptable six meters/pixel resolution.

By pulling down the **View** menu and choosing **Image Information**, we find that our cropped image is 1,315 pixels wide and 1,754 pixels high. Since the whole DOQ covers four 225 x 255 terrain grids (two across, two down) and we will be splitting each terrain grid into nine 75 x 75 arc-second grids (three across, three down), we must now slice the DOQ into six equal rows and six equal columns. To help with this operation, we can display grid lines on the DOQ in PSP. Pull down the PSP **File** menu and choose **Preferences | General Program Preferences, Rulers and Units** tab. In the grid section, designate pixels as units. We need six equal columns, so divide 1,315 by 6 to get 219. Plug "219" into the Horizontal Spacing box. Divide 1,754 by 6, and we get 292. Plug "292" into the Vertical Spacing box. Click **[OK]**. If you don't see the grid lines, pull down the **View** menu and make sure there is a check beside *Grid*.

Our task now is to select the area inside each grid line, Copy, Paste as New Image, Flip the image, resize to 256 x 256 pixels, and Save As for each slice. Click the rectangle selection tool from the Tool palette. Beginning at the upper left of the DOQ, position your cursor over one of the grid corners and hold the left mouse button down while dragging the selection marquee to the opposite grid corner. With practice using the precision cursor, you can quickly and easily position the cursor directly over the grid lines. When you do, the white gridline will turn black. You can use the arrows keys for fine adjustments. After dragging from one grid corner to the opposite corner, release the mouse button and you will see the selection marquee. Now click the Copy button on the custom toolbar we created earlier. Then click the Paste as New Image button beside it. Then click the Flip button. Then the Resize button. The Resize dialog box will pop up. We want to resize to 256 x 256 and make sure the *Maintain aspect ratio* radio button is cleared. Click **[OK]**. Now click the **[Save As]** button. Set *Files of Type* to "RAW," browse to your working texture folder, name the file and click **[Save]**.

Create a naming convention

When naming the texture files, you should stick to a naming convention. There are no hard and fast rules here. Use whatever is easiest for you to prevent confusion, since if we are covering a large area, we will have quite a few different textures to deal with. My own convention is quite simple. I use a two-letter abbreviation of the DOQ, plus the cardinal direction of the DOQQ. In other words, for our example, the DOQ is Franklin, so the first two letters of the texture name for all 36 textures will be "fk." For the nine textures of the NW DOQQ, I add "nw" to the file name, i.e., "fknw." Each

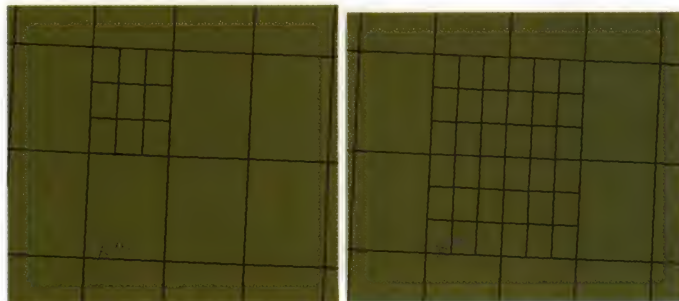
DOQQ will have a top row, a center row and a bottom row. As well, each DOQQ will have a west column, a middle column and an east column. So, the top-left texture of the DOQ will be named fknwtw.r8" That's (FR)anklin DOQ, (NW) Quarter Quad, (T)op row, (W)est column. Conversely, the bottom right texture will be named fksebe.r8. That's (FR)anklin DOQ, (SE) Quarter Quad, (B)ottom row, (E)ast column. And so on. Later, when we are applying the textures to the terrain grids, this convention will help ensure the correct textures are adjacent to each other.

Now continue slicing the DOQ using the above sequence until all 36 grid segments are copied, flipped, resized and saved to your working texture folder.

Applying the textures in ASD

OK, let's go back to ASD and find the four terrain grids covered by our DOQ. If you've lost them, just go to the lat/long you wrote down while downloading the original images. We originally placed these 225 x 225 arc-second grids as a matter of correct positioning in relation to the DEM boundaries. As such, the edges of these larger grids correspond precisely with the published boundaries of the DOQQs. Since we have now sliced each DOQQ into nine equal segments, we must now create nine equal terrain grids out of each 225 x 225 grid. Pull down ASD's **File** menu and choose **Preferences**. Click the *Terrain* tab, and then the **[Set Size]** button. Set the default grid size at 75 x 75.

We'll start with the grid corresponding to the NW DOQQ. Right-click on it and choose **Properties**. Change the size from 225 x 225 to 75 x 75, and click **[OK]**. Click the Terrain Tool and fill in the other eight grids, making sure they "snap to." The result is shown in figure eight. Do the same for the other three DOQ grids.

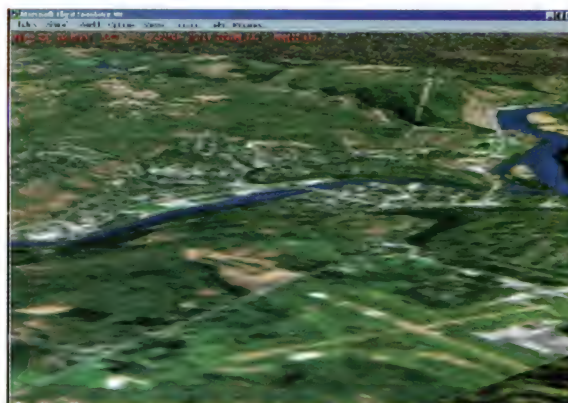
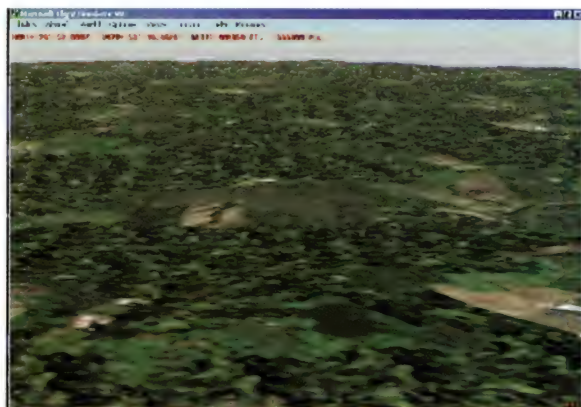


Now right-click on the top west grid and apply the fknwtw.r8 texture. (Make sure the *Apply Entire Texture* option is checked, too.) Move to the next grid and apply the fknwtm.r8 texture, and so forth, until all nine NW textures are applied to the nine NW grids. Continue with the same procedure for the other three grids of the DOQ.



Scenery Design Corner

Save your map and compile. Let's take a look. If we have correctly positioned our terrain grids and cropped our DOQ in the right places, we should see a topographically accurate, photorealistic depiction of the Franklin Quadrangle in Flight Simulator, as shown in figures 10 and 11.



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Scenery design, particularly third-party add-on scenery, certainly has advanced during the last seven years. In 1992 the current scenery engine for Microsoft *Flight Simulator* (FS) was introduced to the market as Flight Simulator 5.1. Now, in the years that have passed, we are adding detail and features that we had never thought possible (or had never thought of) in the quest to truly make FS "as real as it gets."

The details and features with respect to custom 3-D objects, custom texturing and the techniques used to apply them have come a long way during this period. In fact, as I reflect on what was state-of-the-art scenery design when I first began creating scenery for FS 4 over a decade ago, I feel as though we have evolved from the Bronze Age to the modern world during this period.

Nevertheless, the one thing that remained constant through this entire epoch was that the FS world only consisted of *flat world* scenery. That is, various lumps and/or 3-D objects were strategically distributed across an expanse of flat, polygon-textured ground. Real geographical features, such as canyons, gorges and valleys, could only be represented by *building up* on the flat ground to produce a visual effect, like applying special effects makeup to an actor's face. This looks good at certain angles, but up close it just does not make it. And of course, you can always make a thin guy look fat, but not vice-versa. And so it goes with the scenery that has been created before now. A canyon is likely to look like some kind of cheesy claymation prop at most distances/angles.

But now, we are no longer restrained by this preposterous flat-world restriction. Now, some clever sculptor-turned-computer geek-turned-FS-scenery-addict has created *Elevated Mesh Terrain*, right? Wrong! Go back to start and do not collect \$200.00.

By Tim Dickens

The Bruce Artwick Organization already did that for us, *seven years ago when they created FS 5.1!* That's right, elevated mesh terrain (EMT), sometimes called *textured relief*, has been

Everything you about Elevated Mesh Flight Si

a usable part of the FS scenery engine since 1992. It has even been sparsely employed in Microsoft's default scenery from time to time, in places like Las Vegas, for example.

So why haven't you Bozos been using it, too, I hear you bluntly ask? Because, I resolutely answer, it just has not been practical. Actually, I made my first piece of textured relief for the first version of my Nebraska scenery, many, many moons ago. I never released it to the public, because at that time it made my state-of-the-art 486 DX and Trident video card crawl to the speed of a slide show. I tried again a couple years ago with FS 95 and my state-of-the-art P166 with Matrox 2-D video card, and it crawled to the speed of a man walking to the gallows.

But now we have FS 98 and 3-D acceleration. These days, experienced scenery designers are taking another look at EMT as a way to advance realism. And with ASD v. 2.0 coming on the market, with its advanced textured relief tool, the long, laborious work involved in creating this type of terrain is drastically simplified.

In this article I will describe exactly what elevated mesh terrain is, how it differs from the standard "flat world" terrain, and what to watch for when creating this kind of scenery. But this article is by no means intended for scenery designers only. FS scenery enthusiasts may well find this quite interesting as well, as a basic understanding of how this scenery works. We

*But did not

Wanted to Know Mesh Terrain for MS Simulator *

won't be getting into any actual scenery coding here, just the basic principles. Regardless of whether you are an avid scenery designer or only an avid simmer, this will help resolve your expectations of what you can create or see with elevated mesh terrain.

Basic "flat world" scenery defined

Synthetic tiles

To understand what elevated mesh terrain is, we must first understand what it is sitting on top of. This is the good old "flat Earth" world we are so accustomed to.

The heart of the FS flat world is the *synthetic scenery*, a term you have heard before. This gridwork of tiles covers the entire virtual Earth. They come in six sizes, with No. 6 being the smallest. Techie scenery design talk lists these tiles as *sections 1 through 6* of the FS scenery engine. These tiles usually have a bitmap texture applied to the top, although there is such thing as a *transparent* tile. Synthetic tiles have two very important functions:

- ▲ They determine the altitude of the ground. This is where FS ground altitude is changed/established when creating scenery.
- ▲ When using standard textured tiles, they provide the basic appearance of the ground.

The FS tile grid covers the entire Earth. Just like a map, the size of the tiles changes from the equator toward the poles.

For the pilot in the FS virtual world, the changes in declared altitude between tiles make the ground seem to rise and fall underneath your aircraft. This also makes runways in some sceneries float in the air. The tile in the highest priority layer of the FS scenery library determines the altitude of the ground in the FS flat world.



Small grid of alternating textured tiles.

What's that sitting on your tile?

Let's face it, the view out the window is pretty darn boring unless you can put things on top of those ground tiles, like flat objects, such as river polygons, road polygons and city detail polygons. And of course, we do not want to forget those splendid 3-D objects.

Objects are placed within scenery according to *repoints*, or simply put, a latitude/longitude reference point. There are two basic kinds of repoints: type 7, which always places objects at the tile-declared altitude, and type 2, which places

know to ask

Everything you Wanted to Know about Elev

objects at any declared altitude above sea level (ASL). Other types of repoints exist as well, but they don't really apply to this topic. We will refer to repoints again as we discuss EMT.

When creating any kind of mountain, hill, mound or miscellaneous local relief, it is necessary to use one or both of the following techniques:

Synthetic mountains

These are synthetic tiles with 3-D "lumps" built on top. Before FS 98, they were ugly watermelon or football colored clumps. Now, in FS 98 they are textured like the rest of the ground (thank God). FS 98 uses special textures to draw the square tile grid with vertical elevation points to create 3-D elevated polygons. They do a decent job of simulating mountains. Unfortunately, you can not place any other 3-D objects on top of them. Since it is actually a tile, and part of the section 1-6 scenery, it does not use a repoint. The world tile grid determines its location, so you do not have much flexibility with respect to locating or shaping them. FS automatically crash codes these, but sometimes not too predictably.

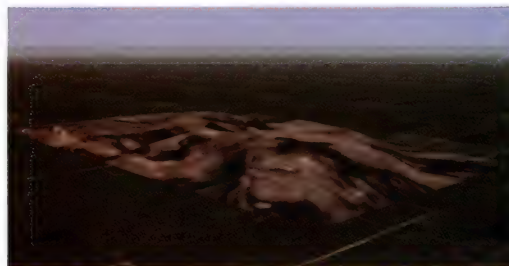
3-D polygon mountains

These are not synthetic scenery, but live in the visual scenery portion of the FS scenery engine, called *section 9*. This is also where the rivers, roads, ground polygons and 3-D objects, like buildings and hangars, also reside. These create a 3-D shape using triangular vertical polygons. This typically disrupts the "texture pattern" of the ground, and sometimes can look out of place, depending on how well they are crafted by the designer. It can also be difficult to place 3-D objects on top of them (but not impossible). This kind of object uses a type 7 repoint (always drawn from tile altitude up). If you want crash coding for this type of "mountain," it must be created as a separate piece of code.

In either case, this type of scenery results in a flat area, punctuated by big manifest lumps. So to be quite honest, the result isn't "as real as it gets." If the scenery is created skillfully, it still looks pretty good, but it is not ideal, particularly when trying to represent a gorge or a valley.



*Example of a 3D-poly mountain.
Note the contrasting texture pattern.*



*Example of a synthetic mountain tile.
Note the square pattern filling one complete tile*

So along comes elevated mesh terrain

Actually, before going any farther in defining EMT, we really have to separate it into two categories, *elevated relief* and *continuous elevated mesh*.

Elevated relief can be described as a limited area of elevated terrain, used to replace those 3-D poly mountains within a defined space. The outer edges of this limited area of terrain must begin and end at tile altitude. Since this type of scenery is mostly flat world tiles, the standard river, road and ground polygons may be used as before. A good example of a geographical area ideal for this technique is where I spend most of my time, here in the prairies of the U.S. Midwest. It offers no drastic changes in local elevation and no spectacular mountain ranges. But like almost everywhere else on this Earth, when you are sitting on the ground at your airports, you can see subtle changes in local terrain. Previously, those "lumpy" 3D-poly mountains could only simulate this local elevation.

Continuous elevated mesh spans a much larger area, most likely the entire scenery area, such as a whole U.S. state, for example. In effect, the whole terrain surface is "floating" above the tiles underneath, and those tiles must all be at the same altitude. Unfortunately, due to the large number of changes in

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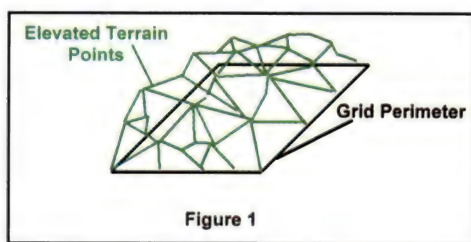
altitude on top of this terrain, normal river, road and ground polys can not be simply placed on top, like you can on a tile. These features must be custom painted onto the textures if you want to see them. But from the aesthetic point of view, all the natural undulations of the land within a given area have a much more natural appearance.

The elevated terrain "grid"

Both elevated relief and continuous elevated mesh are constructed the same way: basically, with a grid pattern. Only in this case, there is no fixed grid system as there is with synthetic scenery.

The elevated terrain is coded into FS by applying rectangular areas on top of the present synthetic tiles. A series of identical rectangular areas comprises a given area of elevated relief (small area) or elevated mesh (large area). These rectangles must match, corner to corner, just like there was in fact a grid. Only elevated terrain is also *section 9* scenery, like any other 3D-polygon object.

Figure 1 shows an illustration of what such a rectangular area looks like in a 3-D perspective. The black line shows the perimeter of the rectangle, which can be either exactly at tile level or raised above it. (More on this in a moment.) The green polygons show elevated points above this perimeter, representing the actual altitude (ASL) of the terrain *above the reference altitude of the black line*.



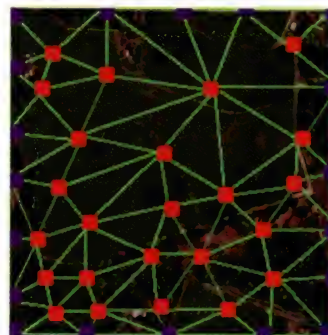
The green polygons are constructed from elevated points coded within the rectangular area.

Of course, in order to do this, we need to know the actual terrain elevation within the geographical area of this rectangle, right? Not only that, we need to have data on all the minute variations in elevation within this area, so that we can draw the polygons and produce a terrain which matches what is seen in the real world.

Fortunately, this data is available from the U.S. Geological Survey (USGS) in a variety of *resolutions* (number of elevation points within a given area). The technique is to take this data, determine the exact elevation points (ASL) within our rectangle, and use these points to draw the ground polygons.

Without getting too techie here, at this point we'll define the rectangle with a refpoint, place it in the exact geographical location we want, and define the exact size of the rectangle. When defining this rectangle's size, we need to keep in mind that we are going to be applying *one FS texture (or portion thereof)* to this area. Therefore, we don't want to make it too big, or it will look very grainy (low meter-per-pixel resolution) in the scenery. So again, without becoming Professor Poindexter here, I will simply define the area as being roughly the same as the area covered by a No. 6 (smallest) synthetic tile. I established this over time by trial and error.

The last step is to code the rectangular area in such a way that each elevation point we got from the USGS data corresponds to a given location on the bitmap texture we are applying to the rectangle. The number of elevation points we apply to the rectangle is called the *arc-spacing*, or put more simply, the amount of terrain variation detail within this given area. The *arc-spacing* is measured in terms of *arc-seconds* of distance between the points (three arc-seconds is a little more than 300 feet at the equator). Obviously, the more elevation points we apply to the rectangle, the more polygons that will be drawn.



Graphic illustration of an individual FS texture with elevation points and polygons superimposed. Red squares indicate elevation points, blue squares represent the altitude at the base of the rectangle, green lines represents the polygons being drawn. This is a simplified example. An actual geographic rectangle may contain 200 or more elevation points.

know to ask

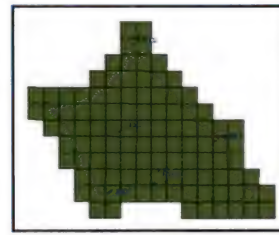
Everything you Wanted to Know about Elevated Terrain

And of course, of great interest to the pilot flying over elevated mesh terrain, it must be noted that it is crash coded. So, if you have crash enabled in the FS menus, you will go out with a big, embarrassing BANG if you come in contact with it at whatever speed your aircraft is coded to crack up at.

Scenery designers should note that this can be tricky when creating menu startup locations or coding for the Aircraft Facility Directory (AFD). Care must be taken that your startup altitude is not too low. If the startup altitude places the aircraft repoint below the terrain elevation point, you will crash on startup from the "Go to" menu. This is particularly important to remember, because now with EMT, your entire airport surface area *may no longer be flat like it was before*. It will be more like the real world, where there could well be several meters difference just between one end of a runway and the other. So watch what you are doing here!

Now that this one rectangle is coded, with the perhaps 100-200 elevation points extracted from the USGS data, you can appreciate the amount of work that goes into producing just one No. 6 tile-size rectangle (about three miles across) of elevated scenery.

You can see that in order to make the creation of appreciable areas of scenery feasible using this technique, a tool which automates this process is certainly necessary. Otherwise it would take years to do an area the size of Rhode Island. Peter Jacobson has recently made this possible for Airport and Scenery Designer (ASD) v. 2.0, which is just now reaching the store shelves. It allows you to set up a standard rectangle size, with all necessary coding parameters (which I will not go into here) and place these rectangles anywhere on your ASD map. ASD v. 2.0 will read data from downloaded USGS files and automatically assign the correct elevation points to the individual rectangles. What would have before taken months of tedious work can now be accomplished in just hours.



The Hawaiian Island of Oahu, comprised of elevated terrain grids in ASD

The base elevation of each rectangle, illustrated by the blue points in our illustration, must be uniform around the entire base and must remain the same for the entire area where several rectangles are joined together. As long as this base elevation remains constant, any number of rectangles (perfectly aligned like a grid) may be used together to create one contiguous section of elevated terrain, seamlessly.

This base elevation should be established according to the minimum elevation of the area where the adjoining rectangles will exist. In other words, if you are doing an entire island, where the coastline is (theoretically) at zero meters ASL, you should set all of these rectangles at zero meters for the reference elevation. Your underlying tiles should also be set accordingly. But if you are doing scenery that is all inland, it is best to find the minimum ground altitude and set your tiles and base elevation to that number.

How elevated terrain affects system performance and frame rates

After all of the above considerations are taken into account and the elevated terrain is compiled into actual scenery, the difference in quality and realism of the ground terrain, compared with the old "flat world," is remarkable. The subtle changes and undulations of even modest local elevation is very realistic, compared to the "lump of potatoes on a plate" effect of 3D-poly mountains on flat tiles.

However, the next thing you will notice is that your frame rates, by comparison, have dropped considerably. This is because elevated terrain requires the FS scenery engine to draw dozens of polygons within only one terrain rectangle to produce the appearance of the ground, where in our "flat world" model there were very few, or even none. Every time you draw a

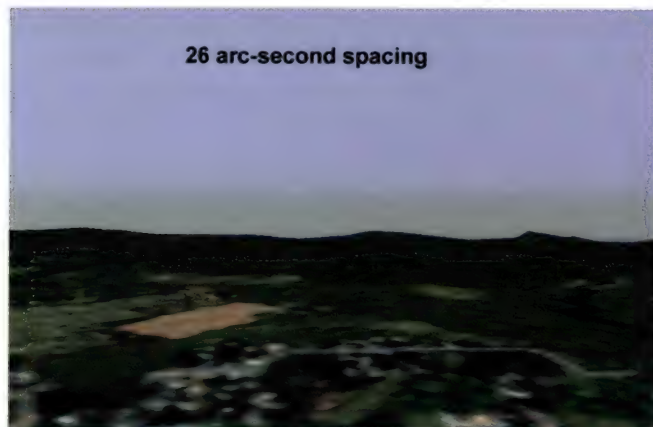
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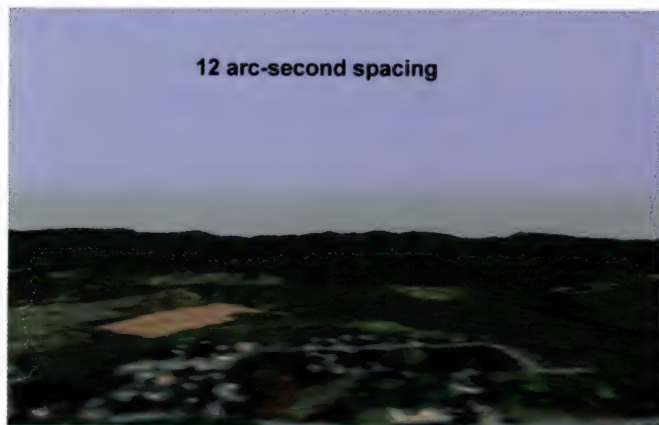
ated Mesh Terrain for MS Flight Simulator *

polygon, the FS scenery engine slows down just a bit. Put several terrain rectangles in view, and the drop in performance is measurable.

If the elevated scenery is designed correctly, it was done with the absolute minimum number of elevation points, or the widest *arc-spacing* possible. If you are flying in some spectacular scenery using EMT that you just downloaded, which looks great but slows your computer down to a crawl, it is likely that the designer did not take this into account, and simply used every elevation point possible.



26 arc-second spacing



12 arc-second spacing

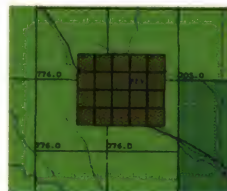
The difference between 12 arc-second elevation point spacing and 26 arc-second spacing is not extremely dramatic visually, but the use of the lower resolution 26 arc-second spacing terrain doubled frame rate performance in testing with some of the more powerful 3-D accelerators

Combining elevated terrain with the "flat world"

Yes, there is absolutely no reason why you can not do this. There seems to be a common misconception that EMT is only intended to cover an entire/large scenery area, and that once you start using it, you can never go back. This is absolutely not true, as there are many different techniques you can use for this very flexible feature of the FS scenery engine.

As an example of this, I will use my upcoming (if I ever find time to finish it) freeware scenery for Nebraska. You don't have to be a geography whiz to know that there just ain't no Rocky Mountains in Nebraska. But there is, more often than not, a good 80 meters of local elevation in just about any airport/area you look at. And then, of course, you'll find more consistent "lumpy ground" as you cross over the Wyoming border.

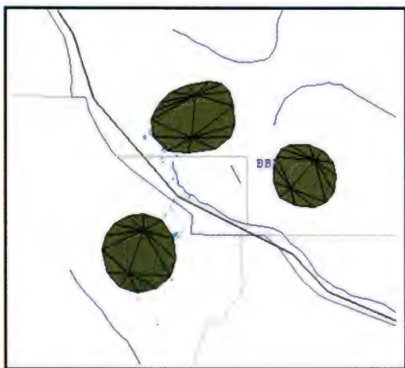
Previously, I used the technique of adding 3D-poly mountains, about 50-100 meters high, around the airport area to simulate local relief on the horizon, as you sit on the ground at the airports. Now it is possible to simply add about 20 elevated terrain rectangles around the airport area (removing the old 3D-poly mountains) and a quite superior local elevation effect is created.



Local elevation rectangles added to the area of Broken Bow, Nebraska. Note the consistent tile altitude underneath. Since the terrain is added at normal tile altitude, the usual river and road structure can still lay on top normally

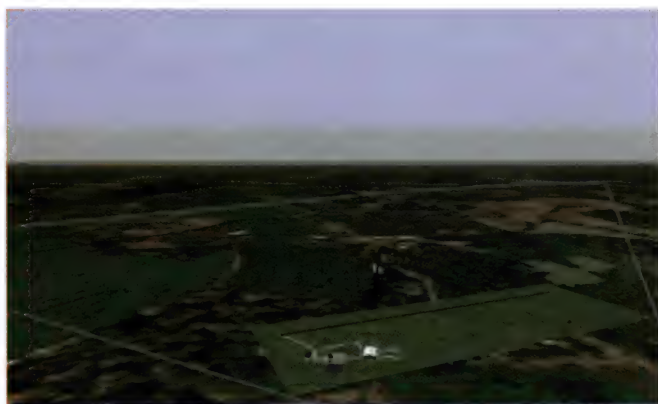
know to ask

Everything you Wanted to Know about Elevation



Previous map view of Broken Bow, Nebraska showing the flat tile/3D-poly mountain technique

The effect is the most noticeable from above, where a 3D-poly mountain will show distinctly as a different texture pattern. The elevated relief shows as a normal texture pattern, which offers a much more realistic view from the air.



Elevated relief from the air has a much more natural appearance.



3D-poly mountains are very obvious from the air.

Adding 3-D objects on top of elevated terrain

Placing 3-D objects, such as buildings, hangars, antennae, etc., is really no problem, as long as it is done correctly. If you are using continuous EMT, covering a wide area, the “ground surface” is typically well above the *tile altitude* declared for the synthetic tile underneath. You will recall we mentioned *repoints* when we talked about what is sitting on your tiles. Here is where it becomes important. The “standard” repoint that scenery designers typically use, type 7, tells the FS scenery engine to draw the object *exactly at declared tile altitude*. Obviously, that will do you no good when your terrain elevation is several hundred meters above that underlying tile. The object will not be visible.

For any object placed on elevated terrain, where the individual terrain altitude is greater than the declared tile altitude, repoint type 2 **must** be used. And the altitude specified for the object in repoint type 2 **must** be declared in ASL, not at the height above the tile. The FS scenery engine only uses altitude ASL for this type of repoint, and it has no idea of what else is going on in the scenery being built. It just does exactly what it is told and will not do any of the thinking for you, so this is something you must have absolutely accurate.

If you are using the combined technique I described for Nebraska, and the airport surface is at the same altitude as the underlying tile, you can go ahead and just use a type 7 repoint.

Visibility issues

Because EMT gives the FS scenery engine instructions to draw polygons “up in the air,” and often quite some distance from the underlying synthetic tiles, many visibility issues can crop up. This becomes even more complex when 3-D objects are intended to sit on top of the terrain.

Again, without becoming Professor Poindexter here, a brief review of the drawing order that the FS scenery engine uses to present scenery objects will clear these issues up.

Objects in Microsoft *Flight Simulator* are drawn and sorted in the following order:

*** But did not**



ated Mesh Terrain for MS Flight Simulator *

1. Synthetic terrain tiles are drawn
2. Ground polygons (non-layered) are drawn
3. *PerspectiveCall2* objects are sorted and drawn
4. Ground polygons (layered) are drawn. Runways typically fall into this category.
5. *PerspectiveCall* and 3-D polygons from synthetic mountain tiles are sorted and drawn. Your 3-D buildings, hangars and miscellaneous objects use *PerspectiveCall*.

PerspectiveCall2 and *PerspectiveCall* are drawing commands that the FS scenery engine uses to sort objects according to their retpoint position in relationship to an observer in the aircraft. In addition, all objects that have a "z" dimension (i.e., altitude, such as 3-D polygons) must be drawn with one of these perspectives.

The FS scenery engine uses *Layering* or *LayerCall* commands to identify ground polygons that are intended to be drawn on top of standard ground polygons, or any 3-D polygons using *PerspectiveCall2*. All objects that use one of the perspectives or have a "z" dimension **can not** use *LayerCall*.

In relationship to EMT, this means:

If you need to place 3-D objects on top of your elevated terrain, you **must** use *PerspectiveCall2*. The 3-D object itself must use *PerspectiveCall*. You can see from the drawing order that this means the 3-D object will always be seen "on top" of the terrain, without the ground bleeding through in any way.

Unfortunately, these 3-D objects will also show through elevated terrain that uses *PerspectiveCall2* when viewed from the "opposite side." There is really nothing that can be done with the relationship of these two.

If you need the standard ground poly rivers and roads, *or airport polygons, taxiways and runways* to show through or on top of your EMT, you must use *PerspectiveCall2* for your terrain **and** use *layering* for the rivers and roads.

The technique I described above in Broken Bow, Nebraska, must also use *PerspectiveCall2* for the terrain if you want these polygons to show up, providing that the EMT altitude and underlying tile altitude are almost identical. Otherwise, a *parallax* effect will take place, and the rivers and roads will appear to "slide around" in relation to the aircraft view. Any use of standard *PerspectiveCall* for the EMT will completely cover the rivers and roads, even if they use layering.

Since the drawing order for coastal polygons, which are really just ground polygons, are the same, special consideration must be made. If the coastal polygon is lying directly on top of an EMT rectangle, the terrain rectangle must be drawn using *PerspectiveCall2*, and the coastal poly must be layered.

And now comes the problem. If the EMT inland, at higher elevations, is also drawn using *PerspectiveCall2*, the coastal polys *will show right through the terrain!* In this case, it may be a good idea to draw those inland EMT rectangles with *PerspectiveCall*, which means they are always drawn *after* the coastline, preventing bleed through (at least while the aircraft is within visible range of the coastline).

This gets tricky, and you need to keep viewing/perspective angles in mind, which will always change from situation to situation. You can also try to minimize this problem by restricting the visibility range of the coastal polys, which is always a good idea anyway from a frame rate point of view.

And that's elevated mesh terrain in a nutshell. Of course, I realize that much of this article has been oriented to scenery designers that have an interest in creating EMT. I hope that non-scenery designers have not found this too technical, as some of the things observed when flying scenery that utilizes EMT can be explained when applying the above considerations. This can be helpful in communicating view/performance problems and hopefully, provide some appreciation for how much technology goes into the *Flight Simulator* landscape.

As new flight simulators and combat simulators are introduced to the market, more and more use is made of EMT. It is likely that the "flat world" will almost disappear someday, since elevated mesh terrain is clearly superior from aesthetic and realism points of view. But then again, the world is filled with all kinds of places like Nebraska.

The good news is that with the proper tools, creating this advanced scenery really is not terribly difficult when compared to "standard" scenery creation. Just apply the principles correctly, and it's rather smooth sailing. And I can tell you from experience, *it really is fun!*

know to ask



Virtual Flight Training: "Can You Hold Please?"

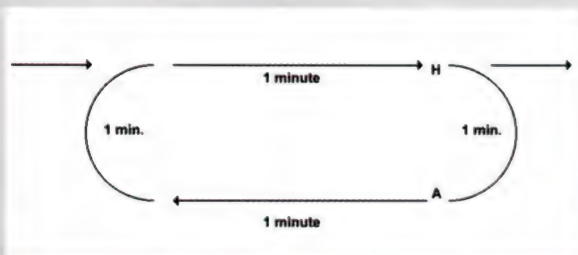
By David Lewis

Holding Patterns

When there's too much traffic in front of your car, you slow down. Eventually, if there's still too much traffic, you stop and wait for it to go away. You can't do that in an aeroplane. It would stall and drop out of the sky. Instead, you have to go around in circles and wait. Aircraft may also hold while waiting for the weather to change.

In fact, aircraft rarely fly in circles, which can be uncomfortable and disorientating, and instead use a "racetrack" pattern. A standard hold is a right turn through 180 degrees, a straight section, another right turn and another straight section. The right turn is a "rate 1" or "standard rate" turn, taking 60 seconds to turn 180 degrees, and the turn coordinator is usually calibrated for this rate of turn.

Just keep the wingtip lined up with the mark on the turn coordinator display, and watch the clock, the heading and the altitude—you should be staying level in the turn. The two straight sections are each one-minute long, making a total of four minutes before the aircraft gets back to where it started.



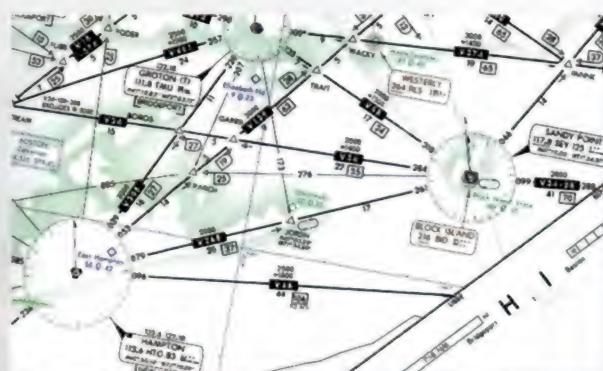
In this diagram, the aircraft approaches the holding point (or "fix") at "H," then turns 180 degrees to the "abeam" point at "A." The outbound leg is flown on the reciprocal course, parallel to the inbound leg, so that the turn will position the aircraft accurately for the inbound leg back to the holding fix.

This column has looked at the development of navigation and flight planning, from the earliest days of biplanes with road maps in the cockpit to the latest jet airways.

This time we'll look at the two missing parts from last issue's flight: holding patterns and approach charts.

We will use the default FS98 scenery for our flight, flying a custom Cessna 421 with panel.

Flight No. 9 Block Island round trip

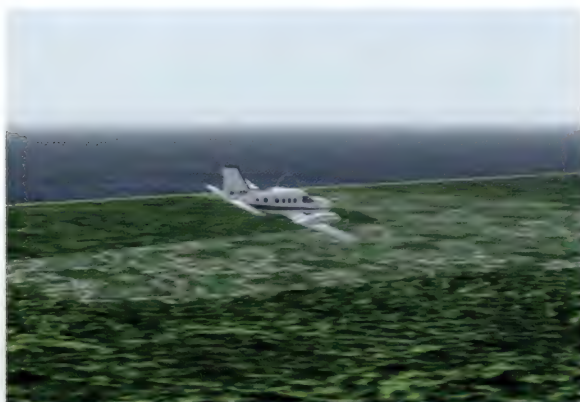


Virtual Flight Training: Holding Patterns



Ready for takeoff, Runway 28, Block Island State Airport

Holding is not easy and deserves practice, so start up the simulator, set the winds to a flat calm, get airborne from Block Island State airport in Rhode Island, USA, and fly directly to Hampton VOR on a heading of 261°. On the way, set up the OBI with the VOR frequency of 113.60 and the inbound course of 261°.



Fly directly to Hampton VOR 113.60



Turn right and reverse course to 81 degrees

When you reach Hampton VOR (and the DME reading gets down to about 0.1), turn right and reverse course to 81°. Fly outbound for a minute, then turn back onto 261°. Pause. As you roll level onto 261°, check the Course Deviation Indicator. How accurately did you hit the inbound radial? Use the CDI to line yourself back up on the radial so you hit the fix exactly, and go around the holding pattern a second time.



Line back up with radial 261

Another way to check the accuracy of your holding pattern is to use course tracking; select **Options | Flight Analysis** and Course tracking, which leaves a snail trail behind your plane that you can watch from any overhead view. Do it right, and you will be rewarded with a beautiful racetrack shape drawn over the countryside.

Holding at a VOR is the easiest kind of holding. As soon as you reach the inbound leg, you can check easily that you are in position by looking at the CDI. The holding fix (and therefore the start of the turn outbound) is shown by the DME nearing zero. However, you may have to hold at a range of other fixes, including NDBs, outer markers and arbitrary intersections.

Coming out of the hold at Hampton VOR, reverse course onto the 081 radial from Hampton VOR, which will take you back along the airway towards Block Island. On the way, tune the second NAV radio to Sandy Point VOR (117.80), which should show the same radial.

Hold at the JORDN intersection, which you can identify in three different ways: DME 20 from Hampton VOR (113.60), DME 17 from Sandy Point VOR (117.80), or radial 173 from Groton VOR (111.80). Go around the hold three times, using each method to mark the intersection, and check the accuracy of your performance. The first time, use Hampton VOR radial and DME. The second time, use the Sandy Point radial and DME. During the second time, retune a NAV radio from Hampton VOR to Groton VOR (111.80), and set radial 173 on the OBI. Make the third circuit without reference to DME, looking only at the two radials.

I mentioned earlier that most holding patterns are flown to the right. Notice on the chart section for this flight that the hold at JORDN is left-handed for westbound traffic, presumably to avoid overflying Montauk airfield & interfering with aircraft in the pattern there.

The final hold for this exercise will be at Block Island NDB (BID), frequency 216, on an inbound heading of 081°. BID NDB is conveniently co-located with Sandy Point VOR, but try not to use the VOR during this exercise. As you turn inbound, a little

Virtual Flight Training: Holding Patterns

mental arithmetic is needed to check the bearing from the NDB, and adjust, just as with any use of an NDB. Try to avoid "homing" on the beacon.

There will be no ILS outer marker practice on this flight, since you must have already been airborne for about an hour. However, the procedure is not very different from the ones described for VOR/DME fixes, using an ILS radial for the inbound leg, and beginning the turn when the beep tells you the plane is over the outer marker.

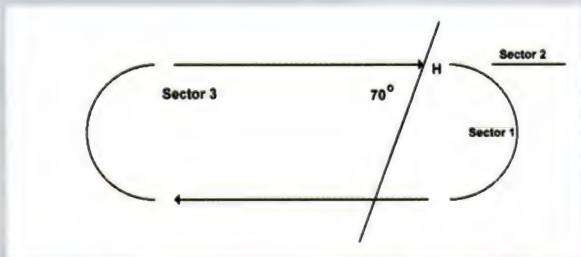
Now land the aircraft and take a bow. That trip was quite a feat of accurate airmanship.



Landing, Block Island Runway 28

Pattern entry

The holding patterns you've flown so far have all been direct entry patterns, and the inbound course has been the same as your course in approaching the hold. However, that won't always be the case, and sometimes you may be asked to hold on a different inbound course. There are three cases for approaching the hold:



If you approach the holding fix from the inbound side (in Sector Three), make a "direct" entry. Fly straight at the holding fix, then make the standard rate turn onto the outbound heading for the first lap of the racetrack.

Approaching from sector 1, fly a "parallel" entry. Fly straight to the holding fix, then turn onto the outbound heading. Fly for one minute, parallel to the inbound leg and on the

"wrong" side of it (away from the holding side). After the minute, turn toward the holding side through more than 180 degrees and proceed to the holding fix ready for the first lap of the racetrack

Approaching from Sector Two, fly a "teardrop" entry. Cross the holding fix and fly onto the holding side at an angle of 30 degrees from the outbound course. Fly for a minute, and turn back onto the inbound leg, straight to the holding fix ready for the first lap.

Many real pilots carry little diagrams with them to help remember how to approach a holding pattern.

Weather

The other great consideration is the weather. When the wind blows, that neat racetrack pattern becomes a very different shape. Start by assuming that you have approached the holding fix at 150 knots into a 30-kt headwind. On the outbound leg, with 30

The Future

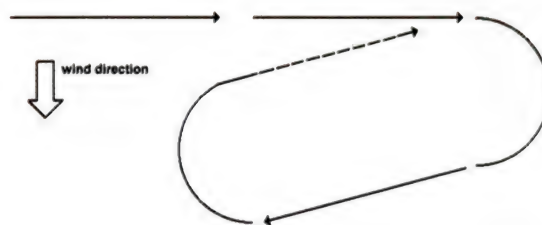
The current system of airways and approaches has been heavily influenced by the navigation aids available. Most airways are point-to-point from VOR to VOR (or NDB in some areas). This seems to be the ideal setup for a linear route. Airways that end at arbitrary intersections of two radials are always harder to find accurately.

The greatest problem facing the air traffic planners is congestion, both at the airport and enroute between airports. One cure for congestion at airports is to build more of them. Existing airports are often fitted with additional parallel runways, which is a lot like building a new airport next door to the old one. The new runway needs its own ILS (and frequency) and possibly its own localizer/marker/NDB equipment. Enroute congestion requires more airways, and if they are VOR-VOR airways, that means a lot more VORs. This approach runs into two problems: the cost of all that equipment and the number of available frequencies. Already the same frequencies are in use by different radio aids, but they are (usually) far enough apart to avoid any confusion in navigation. For example, within Europe 109.10 is the ILS frequency for runways at Esbjerg (Denmark), Berlin Tegel, Prague, Lisbon, Southampton and Lisbon, as well as being used for three VORs. The closer these are packed, the greater the potential confusion.

Virtual Flight Training: Holding Patterns

knots added on to your speed, you will cover three miles in a minute. Turn inbound, and with 30 knots taken off your speed, those three miles will take 90 seconds to cover. So it's not a four-minute hold any more, it's a four minute 30 second hold—not so clever. As a rule of thumb, correct the duration of the outbound leg by the amount of discrepancy on the inbound leg. A better rule, if you know the headwind component, is to adjust by one second for each knot of wind. In this case, both methods give the same answer: fly the outbound leg for only 30 seconds, which will give an inbound leg of 45 seconds.

A crosswind is a bigger problem than headwinds. The outbound leg is flown by compass heading, so you will drift, and the two 180-degree turns will be distorted (one gets wider, one gets narrower), like this:



This diagram shows the safer of the two possibilities. With the wind blowing the other way, the outbound track could actually cross the inbound track, which may lead the aircraft into dangerous airspace. In either case, a good rule of thumb is to adjust the outbound heading by twice or three times the adjustment needed on the inbound leg.

In the flight we just made, all holds were direct-entry, and so the inbound adjustment is known before the aircraft first reaches the holding fix. The reason for doubling the adjustment is to allow for the uneven shape of the two turns, as well as the outbound leg itself.

Visibility is the last element of weather that you should add to your practice. This hold is a purely instrument maneuver, with no direct visual reference, so practice it in clouds and at night.

So, for the master class, go back and fly the Block Island round trip again, but this time fly it in cloud from about 300' AGL all the way up to the level you'll be flying at. Add a moderate wind from the south, and maybe a dash of turbulence in the clouds. Fly that, and you'll appreciate what a great job those professional pilots do—this is routine for them.

The last thing to say about holding patterns is that they are routinely used at the approach to busy airports, with many aircraft holding at the same fix, but at different altitudes. Usually known as a "stack," London Heathrow has four of these holding points. While one aircraft is landing, the next one is ordered to hold at, say, 5,000'. Another aircraft arrives and is told to hold at 7,000'. And so on. Once the first aircraft is well clear, the bottom plane in the stack is cleared to go. A while later, the next plane is cleared to descend. And so on, like some giant multistory auto garage. I've never had to sit through more than three times round the hold, but I've never arrived at the busiest part of the day!

A great deal of effort has gone into devising alternative ways of establishing the aircraft's position, and the bearing to a destination. LORAN, OMEGA, INS and GPS all address this problem. This equipment allows intersections to be defined at a set of Lat/Lon coordinates without reference to any ground-based radio aid, and the cockpit equipment can display the relative positions in just the same way as for a VOR airway. The way is open for a tremendous proliferation of routes.

Another trend is toward computer-controlled equipment, including multi-function displays and moving map presentation. This separates the collection of information from its presentation and allows different presentation to be selected as needed. Some current equipment is famously difficult to interpret, for example, the fact that an aircraft can change heading by up to 180 degrees with no change at all in the CDI for VOR navigation. If the computers know where the plane is and where it wants to go, why not simply have two arrows that can light up to say "turn left" or "turn right?"

The combination of these two trends is likely to mean a complete change in the way pilots navigate. While the earliest skills of visual navigation and dead reckoning will never be obsolete, the elaborate systems of radio navigation that we use today could very quickly be replaced. The future will almost certainly look very different from today.

Homebuilders' Corner

By David Lewis

This issue: *Finishing Touches*

If you've been following this series, by now you should have built and flown a beautiful Tiger Moth of your own. Congratulations on your new career as a test pilot—I hope you didn't have too many crashes! In this issue we'll put the finishing touches on your virtual aircraft.

Flight Dynamics

In the last issue, I listed the aircraft's basic facts as a starting point for creating flight dynamics. These specifications can be found in reference books like Jane's *All the World's Aircraft* or by

measuring parts within *Flight Shop* (to find the tail area, for example). The rest were left to whatever default values are in the reciprocal template. In the case of the Tiger Moth, this produced a dangerously unstable aircraft, particularly in yaw.

Another thing caught during flight-testing was that I forgot to set realism to 8 and (more importantly) turn off auto-coordination.

On a twitchy model, auto-coordination can cause unnecessary rudder movements, and that can mean violent yawing.

The table shows what I changed. The biggest change was to double all moments of inertia (triple the yaw inertia) and to increase the roll and yaw stability factors. This creates a stable, flyable

38. Flying Limitations

- (i) **Maximum Diving Conditions**
Speed permissible 180 m.p.h. IAS (156 knots)
RPM in dive 2200
- (ii) Not more than climbing power is to be used on completion of any manoeuvre. On no account must full power be used.

39. Fuel Consumption

I.A.S.		R.P.M.	Total GLS/HR.	Endurance Hours
M.P.H.	Knots			
75-80	65-70	1950	6 - 6½	2½
80-85	70-74	2050	7 - 7½	2½
85-90	74-78	2100	7½ - 8	2

If carrying out aerobatics and/or prolonged climbing, the fuel consumption increases and the safe endurance in this case is reduced to 2½ hours.



Aircraft type	DH82A Tiger Moth	Date this version	04/19/1999
Configuration		Aerodynamics	
Main wing span	29' 4" (352")	Max. Mach	0.25 (roughly)
Aspect ratio	3.6	Zero flap stall	30 kts
Distance from CoG	-6" (i.e., forward)	Full flap stall	25 kts
Dihedral	3.63 (avge)	Zero-lift drag	.022
Winglets	N	Induced drag	1
Canard	N	Flap drag	0
Hstab distance	174" (aft)	Spoiler drag	.01 (to start)
Hstab area	24 sq ft	Gear drag	0 (fixed gear)
Hstab span	10'2 (122")	Flap moment	0
Tail distance	180" (aft)	Gear moment	0 (fixed gear)
Tail area	27 sq ft	Dihedral scalar	1
Landing gear type	Fixed	Elevator scalar	1.033
Weight & Balance		Aileron scalar	1
Empty weight	1,580 lbs	Rudder scalar	1.125
Main fuel	24 US gal (142 lb)	Pitch stability	1
Aux fuel	0	Roll stability	2
Pitch moment	2050	Yaw stability	3
Roll moment	3440	Gear & scrape	(lat/vert/ion)
Yaw moment	6372	Right main gear	+25 / -59 / -22
Engines		Center gear	+0 / -13 / 186
Engine type	Reciprocating	Nose scrape	+0 / -32 / -73
How many?	1	Tail scrape	+0 / -13 / 186
Max. power	130 hp	Rt. wing scrape	+176 / -17 / 41
Fuel consum.			
Prop type	fixed	Misc.	
Prop high RPM	2,400	Length	23' 11" (287")
Prop diameter	72"	Height	8' 9.5" (105.5")
Turbine temp		Max. level speed	92 kts at sea level
Oil temp	1	Cruise speed	70-75 kts
Oil pressure	1	Range	210 nm
EGT	0	Ceiling	13,600'
Engine 1 pos	5" up, 74" forward	Vne	156 kts
Engine 2 pos		Endurance	2.5 hrs @ 70 kts
Engine 3 pos		Rate of Climb	700-800 fpm
Engine 4 pos			

aircraft that needs leading into the corners with full rudder.

I worried at first over losing control in rolls and loops, until I read the official pilot's notes. Minimum speed for entry to a loop is 100 kts (115 mph); a slow (aileron) roll requires 95 kts (110 mph). Any slower and the Moth is liable to stall out of the maneuver.

Cruising airspeed should be 65-70 kts (75-80 mph) at 1,950 rpm. That's well short of the redline limit, which was also unclear until I checked the manual. It just goes to show the value of thorough

research. The model now handles to match the pilot's notes, so I'm pretty pleased with the result, short of getting it checked by a pilot with time on the real thing.

There's a lovely saying that a training aircraft should be easy to fly safely, but difficult to fly well. That's how this model feels to me.

Since I discussed tools in the last issue, Abacus has released a *Flight Dynamics Editor* and a very full tutorial on the parameters by Rabbija Guder at <http://www.ftmagazine.com/tutorial/airfile.htm> (he describes a fully worked example for a Me-262). The tool is available from <http://www.abacuspublisher.com/catalog/s372.htm>. The article gives several insights into how *Flight Simulator* uses the various parameters and also an alternative procedure for calculating the center of gravity. It's highly recommended reading.

Significant changes from template values are the Pitch, Yaw and Roll Moment and Pitch, Roll and Yaw Stability.

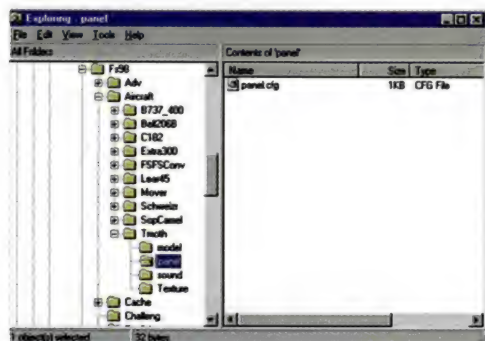
Instrument panels

The subject of building custom panels has been covered in this magazine before, and by more experienced panel-builders than I. However, I couldn't leave the Tiger Moth with a Cessna panel, so I've got to at least change it to something more appropriate.

Looking at photographs of the Tiger Moth panel, I see it's very basic. The top row of instruments displays airspeed, turn & slip and RPM. The bottom row contains altimeter, compass, oil pressure and magneto switches. The exact position of gauges seems to vary from machine to machine. The instruments are distinctively old: the oil pressure gauge is like a thermometer, and you look down onto the big, flat-mounted compass. The Sopwith panel would make a good choice.

The panel is set by the file PANEL.CFG in the FS98 \AIRCRAFT\TMOTH\PANEL directory.





You can open this file with Notepad (it's just a text file), and find the line:

```
alias=FSFSConv\panel.Recip.rg.1
```

Change this to:

```
alias=SopCamel\panel
```

Now you'll be flying with the Sopwith instruments, which are very appropriate for the period and quite usable, if only the altimeter was a bit clearer.

Special effects

A range of new facilities have now appeared that are sometimes described as "trans-fsfs," since they go beyond what *Flight Shop* supports, but are based on aircraft built with *Flight Shop*. These include transparent windows and moving parts. If you are familiar with scenery-building tools like SCASM, it's now possible to enhance your *Flight Shop* models with a range of extras.

A good tutorial on moving parts has been written by Antonio Godoy & Manuel Medel (medelok@hotmail.com), which is available on the Web as TUTORMP.ZIP. The first consideration is that any moving parts have to be built separately in *Flight Shop*, which means wings with separate flaps and ailerons (and probably more glue).

It also looks as though the next generation of aircraft-building tools will have these features built in, which is good news for the non-programmers among us.

Packaging

With all this work done, your aircraft is ready to be released to the public. Obviously you'll want to make some kind of .ZIP file or similar archive containing everything in your FS98\AIRCRAFT\TMOth folder. That covers the .AIR and .MDL files and all the textures and configuration files. What else is missing?

Problem planes No. 7: Mix 'n' Match

Whether you're building a collection of aircraft by other designers for your own flying or looking for inspiration on a design of your own, you will probably acquire and fly many aircraft files. One common problem is finding an aircraft that looks just right, but flies like a brick, while another handles perfectly, but appears less impressive. And neither of them has a good instrument panel!

The simple process for swapping instrument panels was described above. If you want to copy the handling of a plane that handles well to one that looks better, the method is even simpler. All you have to do is copy the .AIR file that handles better (e.g., FS98\AIRCRAFT\FLYRIGHT\FLYRIGHT.AIR) into the folder of the plane that looks better (e.g., FS98\AIRCRAFT\LOOKGOOD), and rename it so that the imported name has the name of the original one (e.g., LOOKGOOD.AIR).

Visual problems can occur if the two planes had different centers of gravity. I don't believe that the .MDL file plays any part in defining how the plane handles, but it does decide how it's drawn, and that could be two feet in the air or with the wheels buried underground. But nine times out of ten it works well enough.

Better still, if you've got the .AFX files, you can copy parts (just copy the .AFP files) from one plane to another. Do this to get the best wings on the best fuselage, etc., and then use *AirEd* or *Abacus' FDE* to read and copy all the handling parameters from one plane to another. Admittedly, this is a bit more long-winded, but it definitely gets around any possible incompatibilities. While you're working with the .AFX file, why not take the opportunity to convert your plane into one of the variant sub-types?



Examples of the actual Tiger Moth



Have fun finishing your plane, and I look forward to seeing it on the Web and flying it myself. Safe landings!

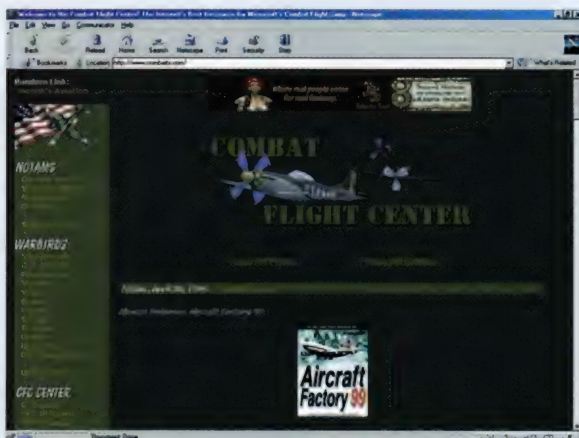
Stall speed (slats open)	25 kts (engine on)
Stall speed (slats locked)	35 kts
Cruise speed	65-70 kts at 1,950 rpm
Climbing (min speed 60 kts)	2,100 rpm
Descending (58 kts)	11-1,200 rpm
Approach	Slow to 48 kts at 250'
Range	175 nm approx.
Max. permitted speed (Vne)	156 kts

Internet Sites for Simmers

Continued from page 15

The sitemap makes it really easy to get where you want to go in a hurry. This can be extremely helpful to those who want to get their questions answered and find those files to enhance CFS quickly.

My commander recommended I check out <http://www.combatfs.com> for my second mission.



I found a lot of general files and information dealing with FS98 and Combat Flight Sim. You can find missions, aircraft, sounds, panels, utilities, maps, textures, links and current news and message boards all at the click of a button. The aircraft for CFS are divided by forces. You can enter the download areas for American, British, Japanese and German planes.

The simplistic layout of the site makes accessing what you want very quick and easy. Every vote counts, so be sure to cast your vote for the best nose art!

There is so much information on this site, you may want to plan a good half an hour or so to investigate the whole site.

My third mission brought me to <http://www.geocities.com/CapeCanaveral/2955/index.htm> (watch the capitalization—browsers are picky!).



Continued on page 96



Flights of Fancy

By Sherman Kaplan

I tugged at the zipper of my bombardier jacket and pulled up the fleece collar to keep out the chill. I had done it hundreds of times before. The jacket was all I had left from my father, whose C-47 went down in a flight over The Hump during World War II. I was too young to fully understand, but I remember the telegram from the government and how Mom broke down and cried.

Dad wore that jacket on every flight; it was his good luck charm, he said. But, this time, for some reason none of us will ever know, he left the jacket hanging on its hook. It's all I have in the way of a physical possession from him.

So, now it's my turn to fly again. My plane is an old DC-3, the civilian version of the C-47, of course. This one has more miles on her than Carter has pills. She sports the blue and white paint job from her days in service for South African Airways.

I got her from Ace, as part of the deal to fly missions for them and keep my mouth shut. But, the story needs to be told, so I'm telling it. I'll never forget that first time out. I climbed into the cockpit, only to be surprised by the

presence of a co-pilot assigned by Ace. He made it clear he was there to watch me as much as assist. He did a lot more watching than assisting. He looked as if he hadn't bathed or shaved for almost a week, and he smelled like it, too. He was none too friendly, but that's OK. I had signed on for the money, not the conversation.

After my walk-around and a couple Hail Marys, I strapped myself in, and the co-pilot did the same. I admit a special fondness for the DC-3. I love it every time I turn the starter and listen to the magnetos catch as the engine coughs, belches bluish smoke from its exhaust pipes and then sings like a canary, or maybe she croaks like a bull frog.

Now, with the twin engines set to idle, the co-pilot gives me my assignment. I was warned in advance that these missions would not be typical American Airlines routes. I had a planeload of gamblers as eager to leave Las Vegas as I was to take them. No one told me why they wanted to leave so quickly, and it wasn't my business to ask. All I knew was they were to be flown to the airstrip at Grand Canyon, a short trip as the crow flies.

But, I wasn't flying like the crow. We took off, and I kept my eye on the altimeter the way a balding accountant on convention keeps his eye

Flying the most unique missions of your life with Ace Airlines

Ace is set up for most any version of Microsoft's *Flight Simulator*. Once signed onto their Web site, you can tour as a visitor or sign on as a pilot. But take a couple minutes to read up first.



on a strip-tease dancer. We had to keep below 4,000 feet, out of the way of radar. The surly co-pilot gave me my vectors, and instead of flying straight to the canyon, we were heading north toward Utah and a VOR called Moab Junction. Then we turned south, more or less, for another waypoint. This took us through some mountains, and I mean that literally. I could not fly over them for fear of being spotted on radar, so I threaded the needle and hoped that not too many passengers would hurl up their lunches.

Well, we made it. My passengers got off, and that's the last I saw of them. I picked up some cash for my efforts, minus fuel, of course. I don't know what happened to that co-pilot, but I knew that as sure as Howard Hughes made movies, I was going to see him again if I took another Ace mission.

The Las Vegas to Grand Canyon mission is just one of dozens of scenarios crafted by David Edwards and Phillip Brander, the two Australian flight sim enthusiasts who created Ace Airlines. Ace is different from any other virtual airline (VA) you might have flown. These are not your traditional routes; no STARS or SIDS. With Ace, you fly under the radar, in close contact with the scenery around you. It is easily the most imaginative VA I know of in my years of flight simming.

If you have a sense of imagination (and isn't that what flight simming is really all about?), you'll have no trouble seeing yourself as Brian Donleavy or Van Johnson behind the controls of an old bucket of bolts, darting through the clouds as the star of your own "B" movie.

The one thing Ace may have in common with other VAs is that pilots do progress to higher ranks and better aircraft. The blue and white South African Airways DC-3, nicknamed "Bertha," is your starter. You get her for free with a \$10,000 bonus. From there, you are on your own. You'll need to maintain Bertha, bringing her in to the shop after every 20 hours of flight. If you skip a maintenance period, Bertha's reliability rating goes down a notch, and since that reliability may be none to good to begin with, why take chances?



Over the Chicago skyline



On a mission to somewhere

I did and I paid the price. It was an ambitious mission, one too ambitious for Bertha as it turned out. I agreed to ferry some escaped convicts from central Alaska to a destination out in the Aleutians. Of course, I had a co-pilot aboard; I'm sure that beneath his jacket he was packing some heat. I didn't really want to find out. As in other flights, I got take-off clearance and vectors. I was going to try and cover almost 1,000 miles in Bertha, and I knew that I was pushing her to the limits.

Well, to make a long story a little bit shorter, I was about half way through when my oil pressure gave out. I don't mean it got weak; it died—at 3,500 feet up. Fortunately, I was over some fairly smooth tundra and made an emergency landing. There was not much to do but wait, and wait, and wait. The best thing I can say for that co-pilot is that he knew more about the innards of that old plane than did I. I took a nap while he made the repairs. We weren't worried about the cons; where the hell were they going to run to in the middle of Alaska?

Finally, the repairs were finished, and I did a hard-earth take off that went well. I was pretty close to the town of Bethel and figured this would be a good place to take on more fuel, since my tanks were getting emptier by the minute. After an easy landing on RWY 18, I

taxied over to the FBO, turned off the engines and topped off my tanks with a couple hundred gallons.

That's when the co-pilot piped up again, telling me I had broken some fool rule. He virtually kicked me out of the cockpit and took off, leaving me in Bethel to fend for myself.

The lesson is that the rules of Ace are there to be followed. Pilots download the airline's proprietary software, which installs the various missions, situation and adventure files. Though text scrolls across the top of the monitor, there is also a zipped .wav file so you can hear your co-pilot bark out commands, comments and insults in his thick, Australian accent. Of course, with a certain keypress combination, you can set the guy back a peg or two, too, at least for a few minutes.

Completing each mission brings more income. With income, you may upgrade your aircraft. A more reliable plane, with greater range, means you can earn more dollars. As a pilot, you can own up to three different aircraft, using each for suitable missions. You can buy your planes from Ace or from the black market. This is one of the more interesting aspects of this fascinating virtual airline.



Mission opening page

Each mission comes with a description, so that you know a bit (but not too much) of what to expect. For instance, there's this one:

So, you reckon you've got a yen for flying? Well, you will after this mission! The Japanese government has contracted us to fly the printing plates for the new Japanese Yen from the plate making plant in Asahikawa to the printing press at New Tokyo Narita International airport. Of course, we're not suggesting you do anything

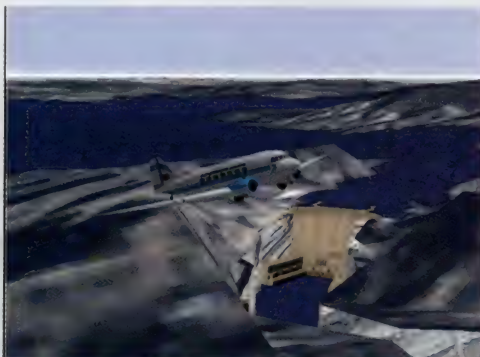


illegal, but if you just HAPPENED to take those plates, and sort of ACCIDENTALLY dropped them out the window en-route, then you just MAY happen to find a similar set tucked under your seat to replace them!

In another scenario, you are asked to fly a contingent of American and English soldiers to France, to do something about the French nuclear testing program. It's all top secret, so I cannot say more than that. You'll learn all you need to know when you need to know it.

Not every mission is that hush-hush. I flew a plane load of, how shall we call them, "ladies of the evening" from San Francisco to Sacramento for their annual peroxide checkup. That was some flight, I can tell you! In another one, which had me taking off from Atlantic City to Baltimore, I had a group of football fans heading to the big game. The way the beer was flowing, it's a wonder that any of them could see anything. I know they were not feeling any pain by the time we landed.

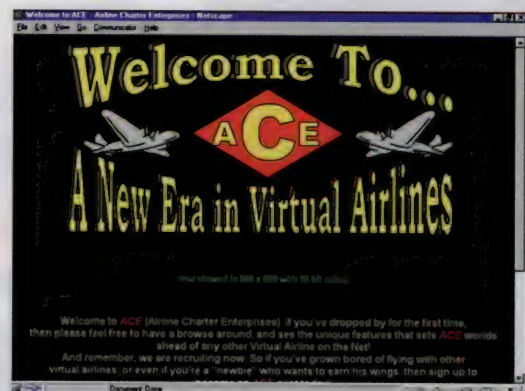
The imaginative scenarios are terrific vehicles to see some of the great sceneries created for *Flight Simulator*, sceneries you or I might not otherwise see. For instance, on that flight out of Vegas to the Grand Canyon, the detour through the southwestern corner of Utah brought me to a wonderfully interesting range of mountains. Ace's founders intended to keep flights at a fairly low altitude in generally clear weather, so that the excellence of Justin Tyme's Delmarva, Tim Dickens' trio of Great Plains states, Basil Copeland's Alaska and the contributions of other top-flight scenery designers could be appreciated. And, with FS98, the default scenarios, even without enhancement, often reveal terrific surprises, not to mention Easter eggs.



Climb-out over Hoover Dam

The time may come when I finally dig myself out of this debt hole I'm in and can move up to something other than Bertha. She's taken me places I never knew existed, destinations I would never have hoped to have seen, situations that forced me to stretch my imagination and use my sim flying talents to their fullest. I'm going to leave you to your own devices now, and maybe your imagination, too, if you think you are up to it. Maybe you'll get lucky like my dad was in the war, at least before his luck ran out. I still remember one story he told me about a flight to Casablanca. He went there to pick up a guy named Rick Blaine and his friend Louie—something about taking them down to The Belgian Congo. I still remember him telling me how he wanted to get in and out as fast as he could without running into Major Strasser. He'd had some dealings with that Nazi scum sometime earlier, when he flew a woman named Ilsa and her husband Victor to Prague. But, that's another story, for another time. Maybe, the next time we're together again, you can buy me a beer or two and I'll tell it to you, just the way my old man told it to me.

Ace Airlines is at <http://www.flyace.com/>.



Sherman Kaplan is a broadcast news anchor for WBBM News Radio 780 in Chicago when he is not sim flying.

A Look At Dangerous Airports

I have written before that the preparatory phase of any flight is careful planning. This implies that the pilot be familiar with the approach at his destination airport. Flight simmers take for granted the fact that there are no obstructions in *Flight Simulator* and that they can land anywhere in any fashion. The truth is that, there are always obstructions in real life. Try flying below the glide at Innsbruck or Berlin Tempelhoff, and you will see what I mean.

Dangerous Airports (from Abacus Software) provides this challenging environment for virtual pilots and thrill seekers.

Installation, manual and maps

An installation wizard smoothly loads the *Dangerous Airports* files onto your computer. The 32-page manual is well documented. I somewhat regret that no real approach charts have been included. Likewise, it would have been a better idea to include each terrain chart on its own page. That being said, *Copilot* users can load the map files included on the CD-ROM, load the .bgls and create their own airport and approach charts, since this is where the airport charts come from in the first place. However, not everyone has *CoPilot!* Each airport page has a description of the surrounding terrain and tips on how to fly the approach, so make sure that you read at least this part of the manual!

Phil Pashutine is an independent writer and reviewer. Please note that Full Throttle is owned and operated by Abacus, who is also the publisher of *Dangerous Airports*.

Review by Phil Paschutine

Pages 15, 17 and 27 of the manual have been updated and can be downloaded from the Abacus Web site at www.abacuspublisher.com (the file names are page_05.pdf, page_017.pdf and page_027.pdf).

The aircraft

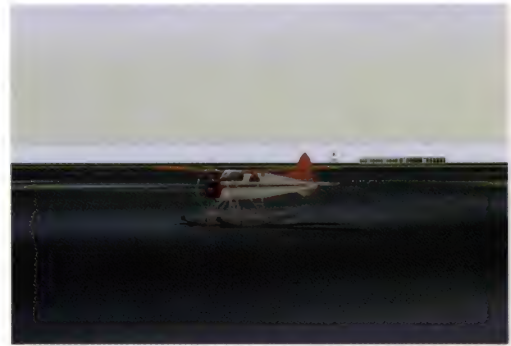
Four planes come with the package. None of them have complicated textures and all, except the DHC Beaver, have lit windows. This is not an issue to IFR aficionados, who usually fly scanning their instruments rather than fly in FS's spot-plane view. The manual gives you each aircraft's specifications. What are really missing are the V-Speeds charts. Since you will operate in high-altitude, mountainous areas, it is nice to know some of the craft's V-Speeds.



Cessna 421C Golden Eagle II Twin engine that will transport your passengers up to 1,700 miles at a maximum speed of 237 mph.



A Look At Dangerous Airports



DHC 2 Beaver: A nice Short Take-off and Landing (STOL) utility transport plane on floats.



Panel for the ATR



Cessna 550 Citation II will carry eight passengers for 1,537 miles.



ATR 42-300 is the ideal twin turboprop for use in hot climates and high-altitude conditions.



Panel for the Cessna 421 Golden Eagle

A Look At Dangerous Airports

The airports

Authors Jim Rhoads and Tim Dickens have rebuilt the whole of each scenery area, so *Dangerous Airports* does not require any other scenery add-ons. The appropriate exclude files are also included with each airport .bgl set.

The scenery is a mix of new textures that enhance the cities, mountains and beaches, plus macro-made buildings and objects, dynamic scenery and *Flight Simulator* default buildings.

I can already hear some of you getting ready for a complaint campaign, "What?! Generic buildings!" Bear in mind that the function of these buildings is to be an obstruction (and to prevent the frame rate from dropping too much). I doubt that you'll want to stare at the textures, absorbed as you should be in scanning your instruments and getting ready to land, unless you are willing to perform a missed approach!

As long as the general area looks like it should, as long as the obstructions are at their correct heights and altitudes, I am sure that IFR pilots will be happy.

The approaches

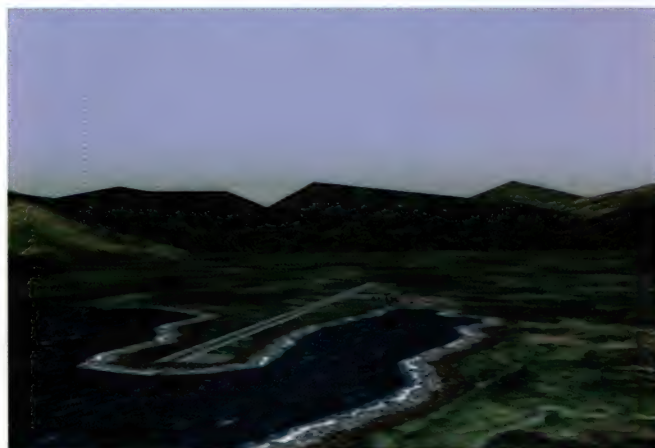
Use any one of the 19 situations that are included. They have bad weather conditions and some include low fuel and system malfunctions. Landing in clear weather and unlimited visibility will enable you to familiarize yourself with the approach procedure. When you feel comfortable with a particular approach, its situation and get ready for some serious doubting of your IFR capabilities, as more than once you will blurt out, "Where the heck am I?"

Of course, succeeding in landing once is not enough, you should be able to do it times over. A well-prepared study of the approach and a good knowledge of the plane are the key to a safe and successful landing.

Remember that adverse weather situations are magnified in mountains. Also, much of the time circling is not permitted and rejected landings, missed approaches (which will be a lot more often than once) and engines inoperative procedures do require special attention due to high terrain. When you land, be careful of airport traffic, as refuel trucks and taxiing planes will be moving around! Be on the lookout for other planes taking off!

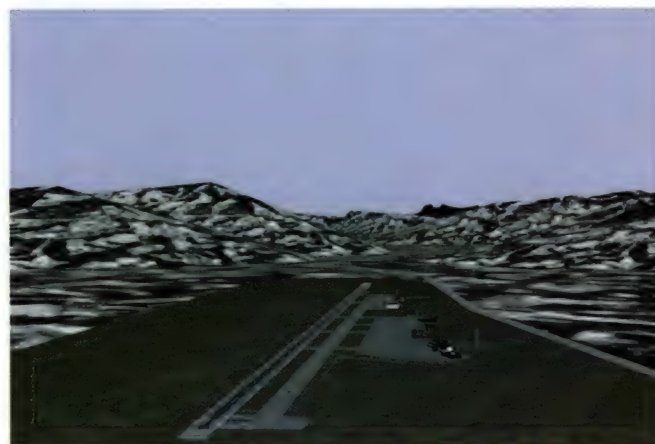
Akureyri, Iceland

To land on runway 01, you must descend from 6,100 ft to 6 ft within six nm from the runway threshold. If not, you might as well say goodbye to the plane's belly. Be warned that the LOC is offset and that you must perform a 25° turn to the left three miles from touchdown. If you think this sounds easy, try this approach in low visibility!



Aspen, Colorado

If you succeeded in landing at Akureyri, then you will find runway 33's approach easy. There is high terrain, and you will need to be very aware of obstacle clearance. There are no straight-in instrument approaches, and runway 15 has a 3° VASI that should not be used four nm from approach end because of the high terrain. Finally, take off from runway 15 is reserved for the experienced pilots.



A Look At Dangerous Airports

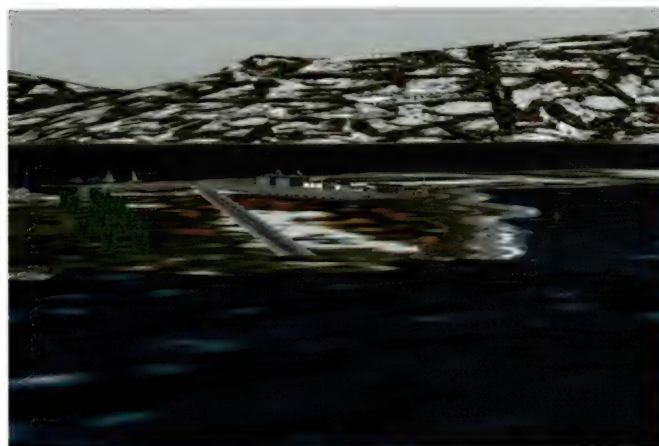
Berlin/Templehoff, Germany

Templehoff airport has a nice approach that should not be too much of a problem if you keep a sharp lookout for the many smokestacks, towers, masts and buildings that are scattered up to 10 nm from the runway! In this case, obstructions do not go that far, and I hope that a patch will address that oversight.



Dutch Harbor, Alaska

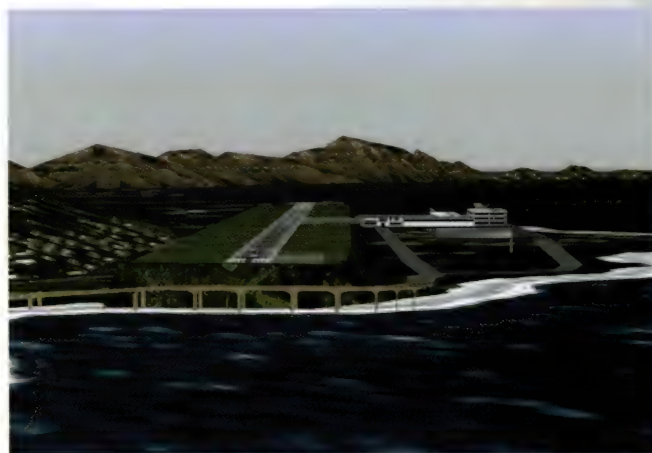
Dutch Harbor airport has no straight-in approaches and a 3° VASI for both runways. Mountains are on either side. Be very careful when landing; the runway is on an island and cold water is at both ends of the runway!



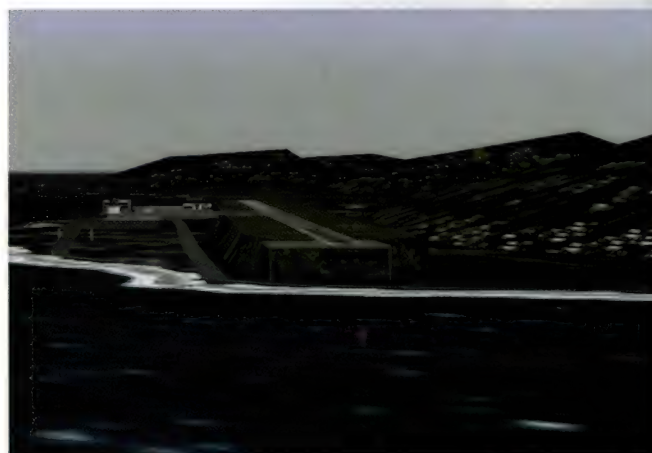
Funchal, Madeira (Hell's fun!)

Located on the east coast of Madeira Island (Portuguese territory) and sitting on a plateau, lies the minuscule runway (you will get the point in a few seconds!). The immediate

airport area can experience windshears and turbulence. Flight simmers will find that Funchal is a go/no go type of approach. Either you touch down or abort the landing properly, or you embed your plane on the metal platform.



I wanted to land on 24. From the start of the situation, I followed NDB MAD, then changed course to a 236° heading toward the runway. It is a 4.5 nm trip from MAD to the runway, so be sure to check the speed and flap settings. Once you hit the touchdown zone, you'll want to apply the brakes and wish you had touched down a tad slower! In real life, a curved ALS leads you one nm from runway 06, but it is missing from the scenery.



I flew the Cessna421C that comes with the situation, but somehow had too many rejected landings. I then switched to the default Cessna and even then had but inches to spare after coming to a full stop. It looks like I will be practicing this particular approach many times!

A Look At Dangerous Airports

Guatemala City, Guatemala

Very high mountains are all around, so you may wish to use the A/P, which will prove particularly useful during takeoff.



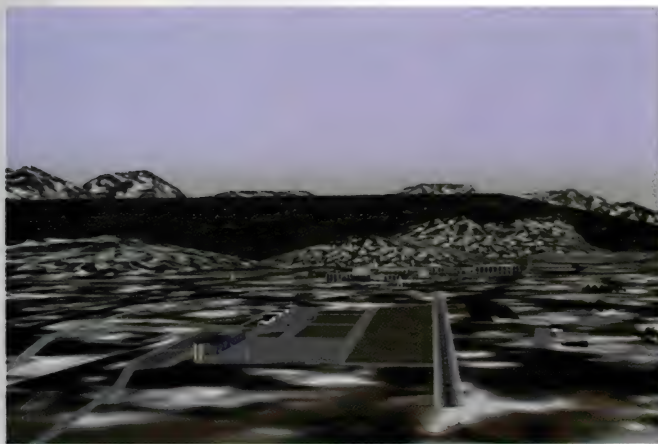
Kathmandu, Nepal

The Kathmandu airport has one straight-in approach to runway 02 only. Very high terrain (10,000' local elevation) is within seven miles of the runway! On takeoff, use the AP to clear those mountains and a nice powerful turbo prop, rather than the default Cessna.



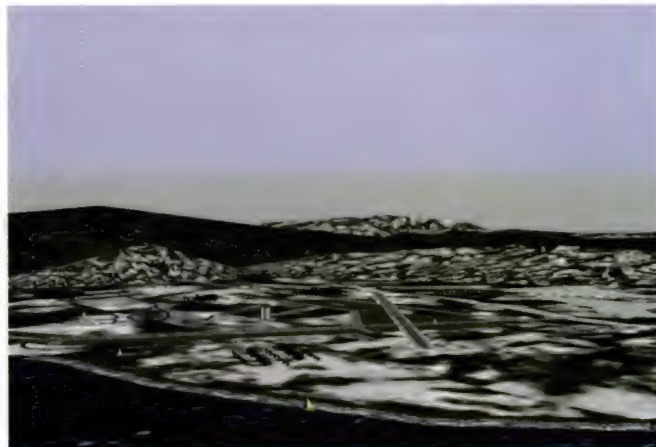
Innsbruck, Austria

The classic *Flight Simulator* dangerous approach has now become THE nightmare!



Kodiak, Alaska

Here you have several nice approaches to runway 25. You need to know how to fly a DME arc (ILS/DME-1 RWY 25, VOR RWY 25) due to high terrain.



A Look At Dangerous Airports

Sondre Stromfjord, Greenland

Runway 10 shows no particular difficulty, except that you cannot do a straight-in landing and will need to initiate a turn close to high terrain.



Dangerous Airports planes

Cessna 421C Golden Eagle II
Cessna 550
ATR 42-300
DHC 2 Beaver

Dangerous Airports airports

Akureyri – Iceland
Aspen – Colorado
Berlin Tempelhoff – Germany
Dutch Harbor – Aleutian Islands
Funchal – Madeira Islands
Guatemala City - Guatemala
Innsbruck- Austria
Kathmandu – Nepal
Kodiak – Alaska
Sondre Stromfjord – Greenland

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(616) 698-0330 (voice)
(616) 698-0325 (fax)

I have been using the word “obstruction” throughout the article, and some of you may wonder if specific charts exist. Yes, they are “obstruction charts,” and this is the definition:

Airport Obstruction Charts (OC) - The Airport Obstruction Chart is a 1:12,000 scale graphic depicting FAR Part 77 surfaces, a representation of objects that penetrate these surfaces, aircraft movement and apron areas, navigational aids, prominent airport buildings, and a selection of roads and other planimetric detail in the airport vicinity. Also included are tabulations of runway and other operational data.

Tips

I advise the less experienced pilots to use a GPS program. Some situations include 0/0 visibility, and if they are not proficient in IFR flying, the outcome of the flight will be pretty grim (although virtual, of course).

Prepare your approach on paper. Use a calculator to compute your approach speed, density altitude. The use of a Koch chart may come in handy for takeoffs.

If at first you do not succeed in landing, try again in CAVOK weather conditions and gradually change your settings to IMC conditions. After that, use the situations. Several airports are located in mountainous areas. Mountain flying is risky, so I recommend that you search the Web for mountain flying techniques or obtain a copy of the Department of Transportation book AC91-15, *Terrain Flying*.

Conclusion

Dangerous Airports is definitely an IFR pilot's dream. Landings and takeoffs are much harder to perform now that obstructions are in the way. The high terrain around some airports makes approaches all the more difficult. Your knowledge of IFR and IMC flying will make the difference. If you are looking for an alternative to those “up until now” safe landings, then *Dangerous Airports* is it.

Missing:

Full-page, real IAPs and airport obstruction charts. V-speed data.

Known issues:

The first commercial copies had several problems that are now resolved. A patch is available at <http://www.abacuspublisher.com/danger/dafaqs.htm>. Second releases do not require the patch.

APACHE HAVOC

Over the past few years we've seen a wide variety of rotor-driven combat simulations, and many of them have focused on the Apache. IMagic's and Digital Integration's *Apache* and *Hind* were re-released in 1998 in the *Front Line Fighters* boxed set, with iF-16 and 3Dfx Glide support for 3Dfx card owners. Jane's *Longbow Anthology* put you in the seat of the AH-64A Apache and the AH-64D Longbow Apache helicopters. The other half of the *Longbow Anthology* included Jane's *Longbow 2*, which finally introduced us to amazing 3Dfx-accelerated graphics, dynamic campaign scenarios and the flyable OH-58D Kiowa Warrior and the UH-60 Black Hawk. Last summer's *Team Apache* from Simis and Eidos Interactive allowed us to pilot the AH-64A Apache attack helicopter and added the element of morale management.

Novalogic's *Comanche Gold* gave would-be Comanche pilots a small taste of what it might be like to fly the US Army's hi-tech RAH-66 Comanche into combat. If you're a rotor-head, there are more than enough great rotor-driven military combat simulations from which to choose.

Empire Interactive and Razorback Studios' *Apache Havoc* is the latest rotor-driven military combat simulation. It may very well have what it takes to please the die-hard *Longbow 2* enthusiasts,

**Review by
Rod White**



APACHE HAVOC

while not forsaking those who like to jump in and blow things up with rockets and fire-and-forget hellfire missiles, as they may in Novalogic's *Comanche Gold*. *Apache Havoc* walks that fine line very well, but not without stumbling in a few places.

Many of you may be saying, "Oh man, not another Apache simulation!" or "I've got *Longbow 2*, why do I need another Apache simulation?" Well, *Apache Havoc* isn't just another Apache simulation. It does model the modernized AH-64D Longbow Apache attack helicopter, but it also models the Soviet Mi-28N Havoc B, which is essentially the Russian equivalent of the AH-64D Longbow Apache. *Apache Havoc* is basically two combat simulations in one, because you can fly both choppers on different sides of the conflicts offered.

Features

Unfortunately, one feature that *Longbow 2* and *Hind* players take for granted is MIA in *Apache Havoc*: the ability to jump into both seats each helicopter offers. Sadly, the designers only modeled the pilot seats in both the Apache and Havoc in this product. This lack is not a showstopper, because with that feature missing, the pilot workload is lessened, making it much easier to play for mainstream combat simmers who enjoy *Team Apache* or *Comanche Gold*. That's not to say that the avionics and flight-modeling realism have been abandoned, because quite frankly, *Apache Havoc* falls somewhere between *Longbow 2* (hard core) and *Comanche Gold* (mainstream) when it comes to avionics, weapons and flight modeling. Some have actually claimed the flight modeling is much more realistic than that found in *Longbow 2*. A few maneuvers, like hitting the rotor brake at extremely high altitudes, make you wonder just how realistic it is, because it takes forever for gravity to kick in and bring the whirly-bird to the ground.

The sensation of speed could be better, too, when flying at 100+ knots 50 feet above the deck. But, the sensation of speed doesn't feel any worse than what is found in most rotor-driven combat



Gorgeous cityscapes and harbors are depicted.



Buildings gradually fall apart from damage.



A Yak on the prowl



The cockpit of the AH-64D Longbow Apache

simulations on the shelves today, aside from *Longbow 2*, which really puts on a nice show when flying fast and low.

All of the vehicles feature remarkable detail and fully articulated moving parts, like the radar dishes on the carriers, the coning of the rotor blades and how the blades droop into view from within the cockpit when not in use. Wiper blades are even installed on both rotor craft, which wipe away the rain and snow that falls during missions.

Graphics

The visuals are very gratifying, and it's safe to say they surpass what you'll find in any other helicopter combat simulation out there. Unlike most combat simulations that offer only 3Dfx Glide support, *Apache Havoc* offers 3D-accelerator support only for Direct 3D-compliant graphics accelerators. This allows TNT, Savage 3D, G200 and 3Dfx board owners to jump in and fly *Apache Havoc*, instead of limiting the access of 3D-accelerated graphics to only those running a 3Dfx product. Each cockpit offers an astonishing amount of detail. You can pan around the cockpit, and when you stop moving, the view snaps to a brilliant, high-resolution image. It's hard to describe, but it's a nice way of melding a lower resolution 3-D cockpit that you can pan around with the level of detail only found in a high-resolution 2-D cockpit. All the gauges and dials are fully functional as well. Over all, it's a very nice piece of work to view, no matter which chopper you're flying. With new video boards like the TNT2 and Voodoo III (and even with earlier generation TNT and Voodoo II boards), *Apache Havoc* is very capable of running at 800x600 or 1,024x768 without any major loss in frame rate.

The default resolution is 640x480, but you can bump it up to 800x600, 1,024x768 or higher. However, all that glorious detail can be lost while in the cockpit at higher resolutions. The problem is that the cockpit art was only designed to run at 640x480, while the graphics engine itself is capable of reaching much higher resolutions. When viewing the cockpit after setting the resolution higher than 640x480, the cockpit will still be stuck at 640x480,

APACHE HAVOC

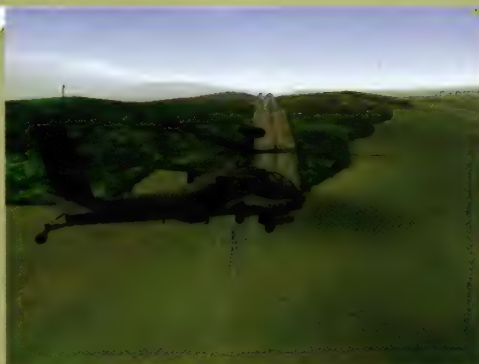
floating in the middle of the screen. To say the least, this looks very annoying and is not a very pleasant way of playing the simulation. Thankfully, you can turn the cockpit art off when going into the higher resolution modes, but it would be nice if Empire and Razorworks would remedy this by releasing new cockpit art to accommodate 800x600 and 1,024x768 modes. Many combat simulation enthusiasts will not be pleased with the "floating cockpit" issue. At press time, Empire Interactive has stated that the "floating cockpit" issue is high on their list of things they'd like to see Razorworks address, but they can't promise that they'll release higher resolution cockpit art at this time.

Ground scenery

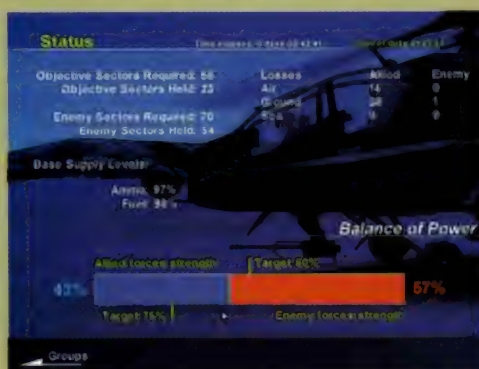
Apache Havoc's designers have done an outstanding job of creating the right kind of terrain to mask helicopters from each other and from enemy fire. Riverbanks, tree lines (very much like those found in Microprose's *M1 Tank Platoon II*), high-tension power lines and hundreds of other 3-D objects can be found in each scenario. Some users may find the color palette used in some places to be odd looking. The water is a greenish/blue color, and some patches of terrain appear hand drawn, which can look out of place where the more photo-realistic terrain meets the hand-drawn textures.

The larger structures and buildings in the simulation take gradual damage. Instead of blowing up and disappearing into nothing, they'll fall apart, revealing the structure underneath. There's nothing like seeing the devastation left from a fire-fight that took place in the boundaries of a city in *Apache Havoc*.

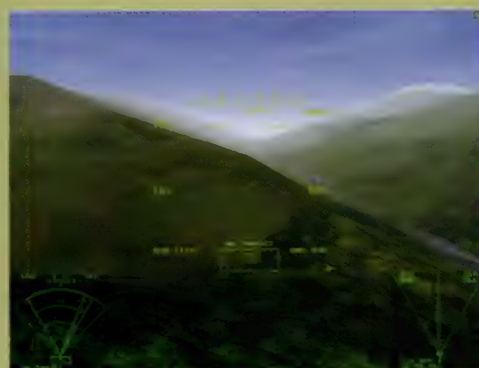
Cities, harbors and bridges come to life as never before in a rotor-driven combat simulation. All in all, the surroundings are well tailored for a rotor-driven military combat simulation.



Mock tree lines and power lines can be found throughout the landscape.



A status report from a Dynamic Campaign.



A view with the cockpit art turned off

Campaigns and missions

Apache Havoc features three dynamic campaign scenarios, taking place in the Golden Triangle (where Laos, Thailand and Myanmar come together), Cuba and Georgia (in the former Soviet Union). Even better, if you don't feel like playing out an entire campaign, you can simply choose one of the many unique Dynamic Missions. These dynamically generated missions give you the benefit of a dynamic campaign scenario, without the restrictions of rank when it comes time to choose a mission type. In the true campaign scenarios, the more challenging missions aren't given to pilots without the proper rank.

Every mission is alive with artificial intelligence (AI). AI-controlled Abrams, Bradley, BRDM-2, T-80, BMP-2 and their support vehicles can be found carrying out their own missions in just about any given scenario. In the air you'll find Harriers, F-16s, MiG-29s, Su-33s, Yak-41s, Su-25s, A-10s and F/A-18s patrolling the skies and being used in air strikes. And hovering in between them all, you'll encounter Mi-24 Hind, Mi-17 Hip, Mi-7 Hook, Ka-29 Helix, Ka-52 Hokum and Havoc Soviet helicopters, and RAH-66 Comanche, UH-60 Black Hawk, CH-46E Sea Knight, CH-3 Jolly Green Giant, CH-47D Chinook and AH-64D Longbow rotorcraft flying for the gold old U.S. of A.

Internet play

As a solo game, *Apache Havoc* is a joy to play. However, the game also features multiplayer options, which aren't quite as much fun if you enjoy playing over the Internet. Options are provided for Internet TCP/IP, modem, serial and IPX LAN gaming. Over the Internet, the performance is just terrible. Even players with cable modems have complained that the lag is too unbearable to enjoy playing the simulation over the Internet. Both Empire and Razorworks are aware of this issue, and from what we understand they plan to try optimizing the code for Internet

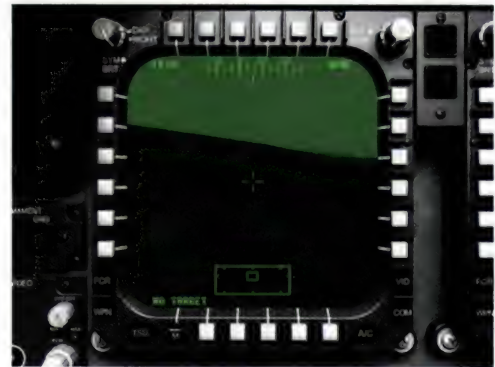
APACHE HAVOC

play even further. But in most cases when a product is this bad over the Internet, chances are it may never be a good combat simulation for play over Internet. Over a LAN it works great and is a delight to play, but modem play doesn't offer the bandwidth the program really needs for an optimal gaming experience. So, LAN games are about the only form of multiplayer games that work well in *Apache Havoc*.

Conclusion

Whirlybird pilots looking for more than just another Apache simulation can find a very satisfying solo combat simulation in *Apache Havoc*. Even with the floating cockpit issue, most users could play it in 640x480 and be quite pleased with the graphics. After all, it really does look grand at just 640x480; it just looks better at 1,024x768 and higher if you have the horsepower and D3D-compliant graphics card to run it at those resolutions. Most die-hard combat simulation enthusiasts have that kind of equipment.

The simulation also lacks the ability to re-map keyboard keystrokes to other keys or joystick buttons. Most Win95/98 games and simulations have this feature these days, and it's a little disappointing to see that *Apache Havoc* doesn't. On the flip side, *Apache Havoc* ships with a very nice, thick manual and a key-card detailing all the keyboard commands.



With three dynamic campaigns of action, it will be a while before you run out of missions to fly. And with the Mi-28N Havoc B to master, there's certainly an excellent amount of replay value for the combat simulation enthusiast looking for a gorgeous and unique new rotorcraft-driven military combat simulation. Multiplayer combat simulation enthusiasts without a LAN should stick with *Longbow 2*, because chances are *Apache Havoc* may never be playable over the Internet with the kind of performance *Longbow 2* and many other new simulations offer.

Apache Havoc does a nice job of catering to the hard-core combat simulation crowd with decent flight, weapons and avionics modeling and dynamic campaigns. It's also the kind of product that a greenhorn pilot can jump into and play, because options are provided under Dynamic Missions to allow unlimited fuel, ammo and invulnerability, as well as the means to set the time of day and weather conditions before taking flight. It's hard to say this is a full-blown, hard-core combat simulation in the same league as *Longbow 2*, while it's not as arcade-like as *Team Apache* and *Comanche Gold*, either.

Radar Contact 99

On almost every VFR flight that I perform in real life, I try to always get radar following. One of the most satisfying feelings I can get is when I hear those magic words, "Radar contact." So it is with JDT LLC's new product, **Radar Contact 99**. Just as in real life when I hear those words, I know that I am under the eye of the controller, and you can bet the same thing when using RC 99 with FS98.

All of us that use FS98 on a regular basis know that if any one thing limits FS98 from being "As real as it gets," it is the lack of an interactive air traffic control environment. Maybe you are the type of flyer that just wants to punch holes in the sky. On the other hand, maybe you would rather not be told what to do. Then FS98 in its present form should satisfy your flying habits. However, if you want to fly FS98 in a more interactive setting that mimics the real-world procedures of ATC, you need to take a serious look at *Radar Contact 99*.

This software takes flight plans generated by third-party flight planners (currently *Flight Sim Planner 98*) and generates audible, controlled adventures for them. I must admit that initially I was a bit skeptical about this new ATC program. I thought, "Oh man, just what I need, to learn another program for which I will have to memorize 20,000 keystroke combinations just to fly from point A to point B." Admittedly, RC99 must be learned, but it really does not involve that many keystroke combinations, is logically setup and is quickly learned. However, the most impressive thing about RC99 is that it is highly realistic. It should be, having been created by Doug Thompson, an air traffic controller in Memphis, and John Dekker, a systems analyst living in Atlanta. Doug's experience shows loud and clear in RC99 and strictly adheres to the 7110.65 FAA rules. You had better be on your toes when flying in Doug's (RC99) airspace. If you stray off course or bust altitudes, you will darn sure hear about it. Doug admittedly told me that he realized that he may seem a bit gruff in some of the recordings, but it was actually meant as a humorous touch (and sometimes what he wished he could say in real life)! RC99 allows you to fly as realistically as possible. You can fly terminal to terminal and get your clearances, talk to ground, tower, departure, center, approach, etc., as in real life or take off from a non-controlled field to a terminal, or *vice versa*. Plan your flight and fly it the way you would in real life, and RC99 will communicate with you just like the real thing.

Installation

It is important to reiterate that RC99 is a front-end generator for other third-party flight planners, producing FS98-compatible adventure files. At the time of this writing, RC99 supports *FS Planner*, by Sascha Felix. Other planners that will be supported in the near future will include *Super Flight Planner*, *Winplanner* and *CoPilot*. Installation was flawless and simple. The RC99 setup program checks to make sure that you have the current VB runtime drivers and installs them if you do not, asking you to reboot the system and install again, if necessary. You will also need to download all of the .wav files that RC99 uses in the ATC adventures! This is quite a massive download and one of the few downsides that I can find in RC99, other than the fact that you will need to also download Martin Smith's APLC 1.25 compiler so RC99 can make your adventures. John and Doug assured me they were looking at alternative methods to make the files available. After downloading, the .wavs are manually placed in a subdirectory under the FS98/Adv/Wav directory. I found the subdirectory method to be a much more logical approach then forcing you to dump them in with the default .wavs like some other adventure programs I had used in the past.

Interface

RC99 will allow you to load and test six sample adventures that make use of the custom .wav files. However, if you want to create your own custom adventures, you will have to purchase RC99 for \$28.00 U.S. dollars. Upon purchasing, you will be required to send in the registration page I.D. number to receive the registration number that unlocks the program and you will be on your way to creating custom flight adventures.

Review by Jim Rhoads



Assuming that you have created your flight plan with a third-party planner as is required, open RC99 and select the appropriate flight planner tab, then pick the adventure from the list.

Next RC99 lets you choose from a list of names, like Bonanza, Cherokee, Speedbird, etc., describing the type of aircraft. You can type in your frequencies for Atis, Ground, Tower, Departure and Arrival. Use the default or type in the real frequencies if you have the data. Then all that is left is to type in your filed altitude, 250 kt. restriction altitude and allowable deviations. Click *Finish* and your adventure will be waiting for you in under **Flights | Adventures** in FS98.

Radar Contact User Input

Aircraft
Call Sign: N140HC
Type: ☐ Jet ☐ Turbo Prop ☒ Prop
Desc: Cherokee

Departure
Departure ID: KFWA
Atis Freq: 12125
Delivery Freq: 12475
Ground Freq: 12190
Tower Freq: 11910
Departure Freq: 13315
Departure Speed: 190
Non-Terminal? ☐

Arrival
Arrival ID: KIND
Alternate ID: EYE
Atis Freq: 12440
Ground Freq: 12190
Tower Freq: 12090
Approach Freq: 119.3
S/T (Hz): ☐
Non-Terminal? ☐

Altitudes
Filed Altitude: 90
Transition Altitude: 180
250k Restriction: 0

Deviations
Heading In Degrees: 15
Altitude In Feet: 300
Speed In Knots: 5

Center
Center Freq: 12105
Announce Checkpoint? ☐

Adventure: Webash to Indy

Back Finish

Lets Go Flying!

Now is when everything gets interesting. Upon loading the adventure, RC99 gives you a hardy welcome and displays a scrollbar across the top of the screen that allows you to change various options in the adventure. Remember this scrollbar, because it is your friend. Typically, you are brought to the threshold of the runway at the beginning of the adventure, however, when using some third-party sceneries, you could find yourself on the ramp or some other unlikely spot. I have always wished that FS would hard code the taxiways and give them an identifier that would allow adventure controllers to give you "progressives" to the runway. This is a request to guide you across the taxiways up to your hold short point or other requested area. However, since that is not possible, you may have to slew to just short of your hold point for the runway.

First things first. Remember your friend the scrollbar? The scrollbar is actually a three-line system that shows only one line at a time for Com, Nav and Runway information. I like to leave the scrollbar on, but it can be turned off if you wish. Information in these lines is displayed and changed up, down, left and right. Up and down changes the lines from Com to Nav to Runway; left and right displays the information selectively within each line. For

instance, I may go up one line to the Com line and then left or right within the line to see what my atis, ground, tower, etc., frequencies are for my departure. This is accomplished with [Ctrl] + [Shift] + [U], [N], [J] or [H]. If you look at your keyboard, you will see that all of these keys are up, down, left and right from each other.

Now, you can communicate with RC's controller in two different ways. You can key the microphone [Ctrl] + [Q] and manually dial in your frequencies or press [Ctrl] + [Shift] + [Y] and let RC99 make the call, switch the frequencies and advance to the next expected frequency on its own. As you travel, RC's scrollbar will display the selected navaid and the frequency for it, as well as the desired heading to it. This works as a poor man's INS (Inertial Navigation System). When it is time to be handed off to the next controller, the scroll bar will automatically switch to the next expected frequency, then once you have established contact, it returns to show the current navaid, frequency and heading.

Radar Contact

File Register About

FSP WP SFP FP 4.0

Select an entry from the list

- COLAMS
- MUNNURN
- MUNHAM
- MUNVIEN
- CHICCHAM
- BRUSATH
- BERLVEN
- TEST
- Webash to Indy

Set As Default Planner ☒

Next Quit

The Flight

I chose an adventure from Indianapolis, Indiana to Grand Rapids, Michigan (one of the legs in the last issue's Round Robin article). After obtaining Atis information and my clearance delivery, I contacted ground, who cleared me to taxi to runway 5R. Contacting the tower, he told me to hold short of 5R. I thought I would be sneaky and maybe ease out to the runway, when much to my surprise, the controller yelled at me and reminded me that he had told me to hold short and to get off the runway. How did he know that?

Anyway, after being cleared to fly runway heading and after talking to departure, I was told to contact Indianapolis center. Not just "center," but "**Indianapolis** center!" Talk about realism.

A Look At Radar Contact 99

As well as communicating with the different controllers, plenty of real-world chatter files in the background occupy the time and add the realistic element of how it really is in the cockpit. I accidentally started tracking the wrong heading. Shortly enough, the controller came back and asked if I had the wrong heading and that I was flying off the airway. Hmmm. He was right.

Next I was handed off to Chicago center, just like in real life. Making contact with Chicago and getting confirmation, I continued to travel along when the controller announce I had traffic 12 o'clock, one mile, crossing right to left, DC-6 at 15 thousand. I actually started looking for the traffic when I thought, "Wait a minute, I know there is not any traffic." The environment is so realistic, it actually had me doing what I do out of habit in real life.

Beginning the approach, I was progressively walked down and speed lowered to accommodate the airspace and then vectored to the localizer for Grand Rapids. Once I had joined the localizer, I was handed off to the tower. I thought I would see if the old boy was really watching, so I made my short final with my gear up. Sure enough, the tower told me to go around and then proceeded to tell me, "It was observed on final that your gear was up. Please watch those checklists. By the way, I prefer my steak medium rare." I thought I would fall out of my chair laughing! After a go around, then a normal landing and being told to taxi to the ramp, I debriefed the adventure by putting on the parking brake. The controller told me that I needed to work on some things, chastised my ability, and

then said he had somebody who wanted to talk to me. Then I heard, "Hey there, my name is Bill Stevens, how are you doing? I am with FSDO, the Flight Standards District Office. We were told you were involved in a possible pilot deviation sometime during your flight, something about a busted altitude, that needs investigating. Do you know anything about this?"

Again, I could not believe it.

Conclusion

Radar Contact 99 is without a doubt the most realistic ATC experience for FS98 that I have found. Many other options are available that I could write on and on about. For example, you can accept holding patterns, declare a missed approach, visual approach, IFR approach, choose delay vectors, request a different runway, and on and on. I have never really been a big fan of ATC programs because of the tedious work and the lack of reality. RC99 breaks the mold and will surely be a companion on all of my lengthy virtual flights. Although it does lack an integrated flight planner and does require some massive downloads to acquire the required files, this program is a definite must-have. RC99 gets my vote for making FS98 "as real as it gets."

Learn more about *Radar Contact 99* at www.flightsimmers.net/radarcontact/.

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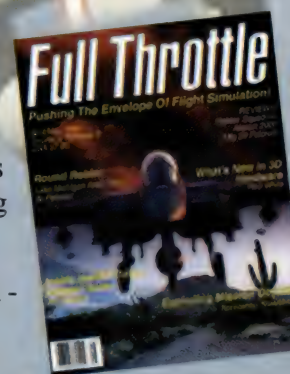
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Product Reviews

Reviewed In This Issue Are:

VIP Ultimate Classic Wings

PAL Programmable Active Link Keyboard Accelerator

Flight Sim Yoke

X-Wing Collector Edition

The Next Generation

R/C Pilot

FS Global Update

VIP Ultimate Classic Wings

Review by Scott Slaughter

The Ultimate Classic Wings is the latest in the "Classic" series from VIP. If you're not familiar with VIP, the name stands for "Visually Incredible Panels" and you'll soon see why they earn the name. Visually Incredible Panels put you inside the cockpit with realistic, accurately rendered and highly detailed instrument panels.

However, the collection is more than just incredible panels. The Ultimate collection includes several variants of different basic aircraft featuring customized colors and liveries from famous airlines or other organizations. They include popular planes such as the Boeing and Airbus "heavies" but also more obscure aircraft such as the Avro Lancaster, Harvard & Wirraway and Vickers Viscount. Don't want to fly a fixed-wing aircraft? VIP includes 12 examples of two popular helicopters. These different paint schemes

or other modifications bring the total number of aircraft in the package to over 220 classic aircraft...truly an "ultimate collection" as the package claims.

Custom engine sounds for most of the VIP Classic Wings aircraft complete your realistic flying experiences.



Manual

The Ultimate Collection includes a well-written and illustrated manual. It includes the almost "mandatory" descriptions of the aircraft types featured in the program but more importantly, the manual also includes tips on handling the aircraft (flight characteristics, instruments, operations, etc.). This is a great addition if you're not familiar with these aircraft or if your skills need some honing - especially for the helicopters.

Installation

You won't need to worry about installing extra aircraft, panels or sound files with Ultimate Wings. The program installs everything for you. Simply follow the on-screen prompts. Either install a single aircraft or install everything at one time. It's just as easy to uninstall the aircraft using the same installation program.

Aircraft and panel examples

All the aircraft are ready to fly immediately after you install the program. You won't even need to worry about converting the aircraft because the Ultimate Collection includes the Microsoft converter program. You'll find these aircraft in the Ultimate Collection:

- Airbus A310
- Avro Lancaster
- Boeing 747-100 to 300
- Boeing 747-400
- Boeing 757
- Boeing 767-300-ER
- Bombardier Global Express
- Canadair Jet
- DHC-6 Twin Otter
- Harvard & Wirraway
- McDonnell Douglas F-4 Phantom
- McDonnell Douglas MD-11
- Sikorski S-61 & Sea King Helicopters
- Vickers Viscount

VIP Ultimate Classic Wings

VIP Group
The Associates
Units A2/A3 Edison Road, St. Ives,
Cambridge PE17 4LF, United Kingdom

www.flightsim.co.uk



As you can tell by the screen shots and this list, the Ultimate Collection is a good combination of civilian, military and commercial aircraft. Each aircraft is very convincing in quality, detail and flying. If you're looking for a summer value, this is it...the ultimate Collection gives you many times the value of other aircraft collections. That's why it's the ultimate collection of aircraft for any Flight Simulator enthusiast.

Product Reviews

PAL Programmable Active Link Keyboard Accelerator

Review by *Tim Dickens*

One continual hassle when operating a flight simulator or combat simulator is the constant need to use the mouse or complicated keyboard combinations to control the aircraft. And with the number of things you have to fiddle with to operate your radios and engine controls and any keyboard strokes required to run your favorite adventures in FS 98, this can become more than just a minor annoyance.

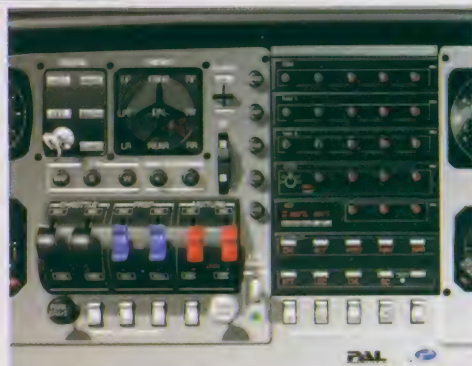
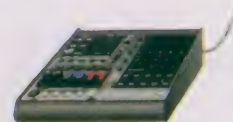
Precision Flight Controls showed me a prototype for the PAL keyboard accelerator (keyboard replacement, really) last year at the E³ show in Atlanta, and I have wanted to get my hands on it ever since. Now I have.

Connecting PAL is very straightforward. It simply attaches in series between your keyboard and the keyboard input on the back of your computer. A cable adapter is provided, in case your computer input does not match the cable. The CD that comes with PAL will install the necessary program files on your hard drive. Then it is simply a matter of running the configuration program and selecting the keyboard macro-function program for the simulator of your choice. Even a program editor is available (purchased separately) that will allow you to customize the buttons on PAL. Additionally, many custom macros for keyboard assignments are available for download at PFC's Web site.

In simple terms, PAL is a small (10" x 8") device that takes the place of your keyboard. It is small enough to sit in front of you, next to your yoke or joystick, and gives you access to all of the simulator functions. Custom overlays for FS 98 and many combat simulators come with it. For FS 98, it offers various overlays for the different types of aircraft you may fly. This provides an easy graphic interface for the function of each control. Searching your memory for the various keyboard strokes or having to use your mouse are things of the past. (Have you ever seen an aircraft that has a mouse?)

PAL keyboard accelerator

Manufacturer's suggested retail price: \$149.95
Available through the Performance Flight Controls Web site at <http://www.flypfc.com/>



Overlay for FS 98 twin-engine props



Overlay for Jane's ATF

If you have a setup like mine, with your keyboard in a drawer underneath the tabletop, PAL is a blessing. With my yoke on top and my keyboard in the drawer underneath, I was constantly moving my chair back and forth to reach the keyboard, which as a consequence of my eating too much linguini, is quite a distance for me. And then, of course, the rudder pedals are in the wrong position. You know the drill. PAL solves that problem by being small enough to sit next to my yoke and provide a graphic overlay for all 96 possible keyboard combinations. If you want to work the Nav1 radio, just use the controls illustrated on the overlay, for example.

Since the PAL has arrived on my desktop, I have had a chance to complete numerous flights with it. It does not take long to adapt to using it in place of the keyboard, and regardless of the component positioning issues I mentioned above, operating the aircraft's panel controls is greatly simplified. And of course, from a realism standpoint, it's kind of nice to have some actual hardware to work, rather than a keyboard and mouse.

I think Precision Flight Controls has a real winner here. It has been needed for a very long time.

Flight Sim Yoke (PC version)

Review by Tim Dickens

Being a general aviation (GA) flight sim enthusiast, I am naturally drawn to yoke-style devices, rather than joysticks. Using a fighter joystick to pilot my twin-engine Cessna just does not make it.

So for years I used the CH Products Virtual Pilot Pro with great satisfaction, particularly when flying GA aircraft with highly calibrated flight dynamics. The VP Pro has been the industry standard for yoke controllers in the less-than-\$100 category.

But as good as it was, it did have a couple drawbacks. Most notably, the sliding mechanism (forward and back) for control of the elevators always seemed to stick just a little, making it necessary to apply more force, subsequently tending to over-control the aircraft. And in general, even minute movement of either elevator or aileron would result in more movement of the plane's aerodynamic surfaces than wanted. I also had a continual problem with the hold-down clamps, requiring excessive torque to make it secure.

These were really minor annoyances, so I never made a fuss about it. But when I got my hands on the new CH Flight Sim Yoke, I realized a whole new dimension to flying. Not only did CH successfully address all of my previous minor complaints, they expanded the quality on the entire product to produce a yoke that performs just as well as all of the very, very expensive ones I have tried over the years.

In fact, I think for the first time I now have a yoke that feels and performs like the controls of a real aircraft. You can finesse very fine control movements in a predictable manner, without fear of over-controlling. The center-détente from the VP Pro is gone, replaced by a return-spring mechanism. This requires a certain amount of force to pull it back, but that force and the amount of elevator movement is linear throughout the range of motion of the elevator. This is exactly how a real aircraft yoke feels.

The look of the new CH Flight Sim Yoke is also substantially improved. Presented in a black case, which sits on the table top easier than the earlier model, and with a black, ergonomically designed yoke wheel, you don't

perceive it as some gray plastic toy. It just looks more like a real yoke. The table-clamping device is a much improved designed, very easy to attach and remove.

The new button/hat switch arrangement is also very well thought out. I believe the throttle control also works a bit more linear/consistent. I think my only real gripe with the CH Flight Sim Yoke is the location of the throttle. It is mounted on top, toward the center of the case, requiring you to reach around the yoke. It would have been better to mount it nearer to the side. But again, this is a very minor issue, not worth breaking a sweat over.

The included software comes with a game controller device,

which looks very slick, but I did not really make use of it for a couple of reasons.

First, I don't think I really need it. FS 98 lets me assign all the functionality I need. Second, I really think the control movements were better without any input from this software.

I also found it a bit buggy to operate.

But of course, there is absolutely no reason why you need to run it. Just let your yoke and the simulator do their own thing, and everything

works out fine. But it does offer you complete programmability of all of the buttons

and hat switches, which could be very useful in a variety of applications.



The bottom line is that I am very impressed with the new CH Products Flight Sim Yoke. I highly recommend that you do not wait until your VP Pro breaks (if you're married, tell your wife it was damaged when you crashed last night). The upgrade in quality, function and appearance is like night and day.

Flight Sim Yoke

This yoke is the standard serial gameport model. A USB version will be available in the coming months, which will also feature mixture and prop pitch levers.

Read more at <http://www.chproducts.com>. MSRP: \$99.95

X-Wing Collector Edition & X-Wing Alliance

Review by Rod White

A long time ago (well, maybe not so long ago), in a galaxy far, far away (maybe not so far away, either), Lucasarts released the first *X-Wing* space combat simulation. I can't think of any kid who is now close to thirty years old who hasn't dreamt of being Luke Skywalker, piloting an X-Wing fighter in the trenches of the first Death Star. With the 1997 re-release of the Star Wars Trilogy, and with the Episode One frenzy in full effect, this dream now consumes all age groups under thirty.

The now classic *X-Wing* fulfilled a childhood dream for many of us, because it gave combat simulation enthusiasts a taste of dogfighting in space. We could pilot the X-Wing, A-Wing and Y-Wing spacecraft against the evil Empire and Darth Vader's minions. The thrill and excitement of being a greenhorn rebel pilot was alive and well in *X-Wing*.

After two expansion packs (one of which let pilots fly the B-Wing), Lucasarts unleashed a sequel. *TIE Fighter* took many of us by surprise, because in it you start out as a greenhorn recruit for the Imperial Navy. This was a unique and bold approach, because the character you portray isn't actually an evil guy. He's just a guy who feels he's doing the right thing by serving the Empire, and doesn't yet realize that the rebels are actually the ones in the right. Best of all, all of the missions in both *X-Wing* and *TIE Fighter* are

truly action packed, with big space battles and loads of seat-of-the-pants dogfighting action. What's more, all of these missions take place in the backdrop of the Star Wars universe.

A few expansion packs were released for *TIE Fighter*, and then a year or so later a Collector's Edition CD-ROM surfaced for both *X-Wing* and *TIE Fighter*. Both of these CDs featured all of the expansion packs for each product, updated SVGA graphics and an extra campaign for *TIE Fighter*. A few years went by and Lucasarts didn't bother to say much about a sequel product.

Then *X-Wing vs. TIE Fighter* appeared. *X-Wing* and *TIE Fighter* enthusiasts had been crying for multiplayer capabilities. We wanted to fly human-controlled X-Wings against human-controlled TIE Fighters, and *vice versa*. Well, Lucasarts gave us that, with Internet multiplayer support to boot. It shipped on two CD-ROMs; one allowed a friend to join in on the multiplayer action over a LAN or via the Internet. At first the Internet support wasn't that great for more than a few players at a time, but you could also fly the solo missions cooperatively, which was a gratifying experience with two players on a LAN, via modem or over the Internet. They did not offer 3D-accelerator support right out of the box, but the 16-bit software rendered graphics looked sharp and clean. Not long after X-v-T was released, the developers, Totally Games, released a Direct 3D patch, giving the game a Direct 3D-accelerated face-lift.

However, they still neglected to include something important in *X-Wing vs. TIE Fighter*. They missed out on giving us the captivating solo gameplay experience

Taking off in an X-Wing from a hidden Rebel base of operations



One dead TIE Fighter

Em-Kay and various trinkets and such that you collect throughout the game





Just one of the many brilliant backdrops you'll find in *X-Wing Alliance*.

presented in the stand-alone *X-Wing* and *TIE Fighter* products. Sure, it had a bunch of solo missions, which could be played out from the side of the Alliance or the Empire, but it didn't have the same charm featured in the classic *X-Wing* and *TIE Fighter* products.

Last year Lucasarts reissued the classic *X-Wing Collector* CD-ROM, the *TIE Fighter Collector* CD-ROM and a special version of *X-Wing vs. TIE Fighter* (a limited, 14-level, trimmed-down version of the product) in the *X-Wing Collector Edition* bundle. What makes the *X-Wing Collector Edition* such a remarkable product is that they ported the classic *X-Wing* and *TIE Fighter* over to the *X-Wing vs. TIE Fighter* graphics engine. Now the classic Star Wars combat simulations came to life with Direct 3D-accelerated graphics and in many places new interface art. Best of all, the *X-Wing Collector Series* is so inexpensive that it's a steal at only \$29! Even by today's standards, the missions and fun factor contained in the classic *X-Wing* and *TIE Fighter* alone are well worth the price of admission.

X-Wing Alliance

With the new Episode One movie frenzy in full swing, chances are it will be a long time before we'll ever see a classic Star Wars Trilogy-based space combat simulation again, which portrays scenarios and characters from Star Wars, *The Empire Strikes Back* and *Return of the Jedi*. However, there is still one title we didn't discuss, which is the most recent Star Wars space combat simulation from Lucasarts and Larry Holland's Totally Games. *X-Wing Alliance* is the most recent and possibly the best space combat simulation from Lucasarts since *TIE Fighter*.

X-Wing Alliance is one of the best story-driven space combat simulation titles to hit store shelves in years. They've taken and updated the *X-Wing vs. TIE Fighter* graphics engine by adding more cool lighting effects and better Direct 3D support. They cleaned up a lot of the existing objects from *X-Wing vs. TIE Fighter* and added a bunch of new ones to boot. 3D-accelerator support is provided for Direct 3D compliant graphics cards. The new colored lighting effects really have to be seen to fully appreciated. We've had a lot of fun running it on a 16 MB Canopus Spectra 2500 (an nVidia TNT1-driven solution) as high as 1,600x1,200 with a very cozy frame rate on a PII 450 MHz system. With a Voodoo II, Voodoo III or even a 3Dfx Banshee card, the game also runs great under Direct 3D.

After completing several missions, you'll be treated to some of the best fully rendered Star Wars cut scenes to ever grace a PC monitor. The opening movie isn't too shabby either. 3-D sound hardware is also supported for those of you with an A3D or Sound Blaster Live! board in the form of Direct Sound 3-D support. However, there's no true stand-alone A3D 1.0, 2.0 or EAX support. If you have a Creative Labs Sound Blaster Live! or an A3D-driven product like the Monster Sound series from Diamond, Storm VX/Platinum from Xitel or a Montego or Montego II from Turtle Beach, the game should run sound hardware accelerated via Direct Sound 3-D.

In *X-Wing vs. TIE Fighter*, the platform space stations dating back to the classic *X-Wing* and *TIE Fighter* stand-alone products were the models used when it came time to depict one. Today you'll still find those classic platforms, but there are also a very wide variety of new space stations, platforms and objects to find throughout the universe depicted in *X-Wing Alliance*.

Two of the most impressive objects you'll come across are the second fully operational Death Star from *Return of the Jedi* and the Millennium Falcon. Best of all, in this Star Wars space combat simulation you can actually take the helm of the Falcon to make the historic run into the bowels of the Death Star, as Lando did in the movie!

The Falcon is essentially a heavily modified Corellian Freighter, and the Falcon isn't the only Corellian Freighter depicted in *X-Wing Alliance*. At the start of the game you'll actually be piloting another Corellian Freighter that looks just like the Falcon.

Hangars are now depicted as 3-D hangars, with the ability to switch views while in the hangar to see things from a different perspective. The character you portray is part of the Azzameen family that owns and operates a legitimate shipping and storage company. Many of the first missions introduce you to other key family members and the rival Viraxo family. Throughout the fifty single player missions you'll encounter pirates, the Viraxo family, the Empire, and a wide variety of new spacecraft. Many of the



(Top left) A massive fleet of Rebel ships;
(Top right) An amazingly detailed A-Wing



missions saddle you with the charismatic droid Emkay. He can pilot, copilot and repair your vessel for you during missions, and always has a few wisecracking comments to keep things interesting along the way. Ships like the Millennium Falcon and the Otana (another type of Corellian freighter) feature laser turrets you can man, so it's nice that you can let Emkay pilot while you shoot.

The way the story unfolds makes playing *X-Wing Alliance* a rewarding experience. Many of the first missions build up the plot of the Azzameen and

Viraxo rivalry, and later in the game your character decides to join the Rebellion to do the right thing and help fight against the evil Empire. Best of all, there will be still times your family calls upon you for help, and you play out those missions in the family spacecraft, the Otana, instead of running off in a Rebel X-Wing, Y-Wing, B-Wing or A-Wing. So, even after joining the Rebellion, you're still interacting with your family, which I think, adds a touch of realism to the game.

Conclusion

The missions in *X-Wing Alliance* are challenging, but not unbeatable.

A nice feature they've added gives you the ability to skip up to three missions in career mode, but take my advice, don't use them all up early on. The missions you may think are tough in the beginning are a walk in the park compared to some of the later missions involving the Rebellion. You'd be hard pressed to find a more engrossing and impressive space combat simulation that featured fifty single player missions like the ones found in *X-Wing Alliance*. Best of all, this is not the kind of game you can finish in a day or two.

In terms of replay value, a mission editor would have been a nice feature, but sadly it doesn't offer one. Totally Games and Lucasarts does offer the Skirmish

Mode, which allows you to pre set some parameters before generating new solo or multiplayer missions, but it doesn't give you the tools to create solo missions that are on par with the solo career missions found in *X-Wing Alliance*.

Knowing how Lucasarts is about third-party utilities, chances are we won't see any great mission editors surface for it either. So although this is by the far one of the greatest solo space combat simulations you can get for the PC, once you've played through the game, there's not much more to do other than engage in multiplayer combat over the Internet or fool around with the Skirmish mode.

Other little features include great force-feedback support and support for joysticks, throttles and rudder pedals, so you can make use of all of your flight gear while playing *X-Wing Alliance*. To conclude, *X-Wing Alliance* may be the last Star Wars space combat simulation that's set in the timeline of the classic Star Wars Trilogy. Thankfully, it looks like they were saving the best for last, because no other space combat simulation out there today that can match what *X-Wing Alliance* has to offer.

X-Wing Alliance

You can find more information on X-Wing Alliance on the Internet at <http://www.jediknight.net/>.

The Next Generation

Review by Scott Slaughter

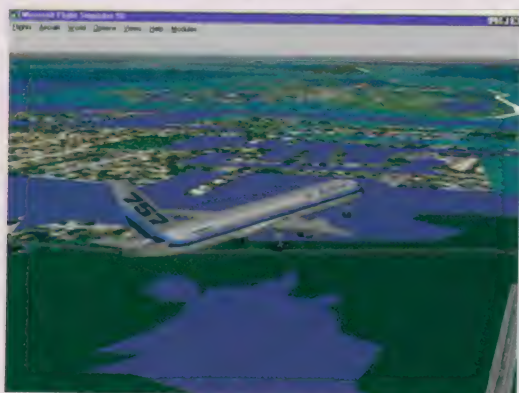
The Next Generation from AETI and developed by Up Front simulations, Inc., features aircraft that include moving maps, flight directors and EFIS that are displayed in the panel. If you've assumed that with these features Next Generation doesn't include small aircraft, you're right. Instead, the program includes true "heavies" such as:

Airbus 320-200 features liveries from Ansett Australia, ANA, America West, British Airways, Dragonair, Inter European, Mexicana, Northwest, United and Virgin.



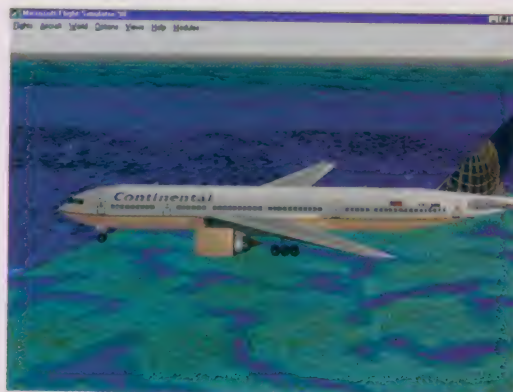
An example of an Airbus 320 included with the next generation is this Northwest model.

Boeing 757 features British Airways, Ethiopian, Canada 3000, Delta, Eastern and UPS liveries.



Flying a defunct airline with a modern aircraft such as the Boeing 757 is possible in the next generation.

Boeing 777-200 features British Airways, British Airways, Continental and United liveries.



This is a Continental livery of a Boeing 777-200.

The **Boeing 777-300** features Cathay Pacific, JAL, Korean liveries.

The **Concorde** features Air France, British Airways and British Airways liveries.

The **MD-11** includes Federal Express, Alitalia, China Eastern, Varig and KLM liveries.



FedEx uses an MD-11 in the next generation.



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New Technology panel

A reason this package is called "The Next Generation" are the features of the New Technology panel. They include Moving Maps, Flight Directors and EFIS Controller.



The instrument panel from the FedEx MD-11 shown on the previous page.

Next Generation panels also include a 50,000 point database for the moving map and FMC, an integrated ground proximity warning system (GPWS), altitude callouts and much more. They're set to work with the autopilot so you can select heading, speed and altitude by simply clicking a switch. This makes flying the long flights in the heavies much easier (you can probably even watch your favorite TV show while flying).

Flight Management Computer

Explained simply, the FMC takes the airplane where you want it to go from your departure airport to the destination airport. The FMC is incorporated into the panel in Next Generation so all you need to do is click it to activate it. The manual included with the Next Generation explains in detail how the FMC is used.



An example of the Flight Management Computer in the Next Generation.

Ground proximity warning system (GPWS)

The GPWS provides audible and visual warnings during flight. Components include takeoff configuration, descent after takeoff, wind shear alerts, ground proximity and more.

Flight Directors

Flight directors give you information on heading and altitude. Simply center the flight director command bars in the artificial horizon and your aircraft will be flying the computed course or climb and descent rate to assigned altitude.

Installation and manual

Installing the Next Generation was painless. Simply follow the wizard and online instructions. Unlike other flight sim program manuals, this one is all English so you're not paying for information you don't understand. It's fully illustrated, well-written and includes full details on using the airplanes, FMS, EFIS controllers and more.

Conclusion

My first bit of advice is to ignore the awful packaging. Fortunately you're not buying the package to hang it on your wall as artwork. But, consider The Next Generation if you're a simmer who likes flying the heavies and who's looking for a good overall software package. It's a good addition to your FS98 collection. The audible tones, call outs and warning sounds add realism that you won't find in most other FS add-ons. It features good aircraft flight models and impressive panels. It doesn't matter if you're a novice or veteran, the FMC, Moving Map and GPS integrated into the panel will make your flying much easier.

The Next Generation

Devkoped by: Up Front Simulations, Inc.
Published by: AETI
3972 Barranca Parkway
Suite J-501
Irvine, CA 92606
<http://simpilot.com>

R/C Pilot

Review by Brian Howard

As my upside-down bi-plane soars over me in the Columbia River Gorge, I pull back on the stick, looping toward the ground. When the plane is stable and right side up again, the runway is directly ahead. I reduce throttle a little further, perform two low-altitude aileron rolls and descend toward the runway. The plane settles comfortably onto the pavement, I cut the engine to idle, and the airplane rolls to a stop at my feet. Several aircraft continue buzzing above me. A P-51 Mustang zooms past a much slower Cessna 182, as their pilots trade jokes beside me on the ground.

While this could happen outside on any nice day, this time it's happening on my PC. The **RC Pilot Radio Control Model Airplane Simulator** brings the fun and challenge of flying radio-control (RC) aircraft without the high cost or maintenance responsibilities. Radio-control aircraft are scale models of life-size aircraft that accurately reflect the flight characteristics of their bigger cousins. Because they follow the same aerodynamic laws as full-size aircraft, RC pilots must understand and master the rules of flight just as any other pilot. And although the damage from a crash isn't as extensive as a real airplane disaster, the time and money spent on repairs is more than enough to keep you on your toes until your RC craft is safely down. But because *RC Pilot* is a simulation, you can afford as many crashes as you need to learn the basics and become a master pilot before you venture outdoors to try the real thing.

RC Pilot's installation is a standard InstallShield. Simply select one of the five available languages, click [Next>] a few times and *RC Pilot* will be loaded onto your system. It requires DirectX 6.0 (which is included), so you may have to load this and restart your computer if you don't already have it. You'll need between 26 and 30 MB free on your hard

drive for the complete installation, and even then you'll need to keep the CD in your CD-ROM drive while playing the simulation. Be sure the provided controller is plugged into your computer's gameport, and you're ready to fly!

The package includes an extensive (50 pages) on-line manual in Word 97 format. The CD-ROM features instructional multimedia videos demonstrating basic and advanced techniques for flying actual models. Don't miss the demonstration of "The Walk," where a (really, really good) pilot brings his plane in low to the ground and creates a stall situation with the plane nearly vertical and the tail almost touching the ground, then deftly maneuvers the plane slowly forward in this attitude, so that the aircraft seems to "walk" forward on its tail.

Double-click the "RC Pilot Multimedia" icon to view the demonstration videos or to find more information about the RC Pilot aircraft or RC planes in general. The "RC Pilot" icon loads the actual sim. The opening screen lets you view the Help file, adjust the simulation settings and select your aircraft and airport. Wind, for example, is one parameter you have control over. You can specify the intensity, direction and gusts, to name a few. Once you've configured *RC Pilot* to your preferences, click [Fly Now] to go to the airport.

RC Pilot provides its own controller: an accurate reproduction of an actual RC controller. Aside from the obvious realism this lends, this hand-held unit also provides excellent control of the aircraft in *RC Pilot*. It features two gimbals (control sticks), each with two axes of movement. Each axis also has its own trim adjustment for precise control. The left gimbal's vertical axis controls the throttle; moving it right or left will steer with the airplane's rudder. Moving the right stick up and down adjust the plane's elevators, and the right stick's horizontal



Product Reviews

axis affects the ailerons. Beyond this, the model aircraft handle just as real ones do. The only thing one has to remember is that the pilot is not in the airplane, so when the airplane is flying toward the pilot on the ground, the lateral controls are reversed from that pilot's perspective. The controller's long cord and hand-held design make for very comfortable flying, as well.

Five aircraft are simulated in *RC Pilot*, and each of these has three difficulty levels: novice, standard and advanced. The standard setting recreates a typical RC experience. The others adjust the speed and control sensitivity of the sim, making the aircraft a little more forgiving for novice pilots or a challenge for experienced RC pilots. You may choose to fly a Cap 232 aerobatic plane, a familiar Cessna 182, a speedy P-51 Mustang, a Patriot jet simulation (it's actually a prop plane like the others) or the colorful Ultimate Bi-plane. Each model reflects the characteristics of its namesake, with the bi-plane capable of staging a one-plane air show and the P-51 breaking speed records. Retractable flaps and gear are featured on the applicable aircraft.

Three "airports" are available. You can fly your RC aircraft in the Columbia River Gorge, Idaho desert or rolling farmland. Each flight arena looks good, with photographic textures marking the boundary of each area. Unlike *Flight Simulator*, for example, you can't take off and just keep flying one heading. You'll want to stay within each bowl-type flight area. At first glance, this may seem like a drawback, but remember, these are model airplanes, so you wouldn't want to take off from point A and fly to point B. Instead, you'll want to buzz around your position on the ground and land very near where you took off. The flight arenas are plenty large for this. When the aircraft is near the airport area perimeter, it's still large enough for the pilot to see and control, but small enough to create a realistic perception of distance. Another nice feature of the airports is that the boundaries are not crash coded, so you won't crack up if you fly too near or even beyond the flight area (crossing beyond the border will result in some goofy graphics until you return to the flight area). Visually, the flight arenas are very nice. I noticed a few minor clipping issues regarding the ground textures when flying very near the boundaries, but that was the only problem I could find. The photo-real textures around the perimeter of each flight arena are very nice, portraying realistic outdoor environments. You can populate the airports with spectators, equipment, architecture and other RC airplanes. My 233MHz test system handled most of these very well, though frame rates began to suffer when other aircraft were buzzing around with my plane.

The *Virtual Revolution* sound technology employed by *RC Pilot* creates Doppler-correct stereo sounds using actual sound recordings of two- and four-stroke engines throughout their RPM ranges. Adjusting the throttles, performing power dives or just flying past your position

sound just like the aircraft should, building a high level of realism. Selectable sound tracks in a variety of musical styles provide relaxing or exciting background music, your choice. Ambient noises, such as birds chirping or other pilots conversing, complete the realistic sound scheme. Some of the pilots' jokes are entertaining and, more impressively, right on cue, often referring specifically to the maneuver you just completed (or muffed).

As entertainment, *RC Pilot* is a blast. Knife Edge and Great Planes evidently put the time and effort into doing it right, instead of rushing a half-baked project to market. From the accurate flight performance of the different aircraft to the spectators laughing at your nosedive into the turf, this sim does a good job of recreating reality in your PC. As a learning simulation, *RC Pilot* does a very good job of introducing newcomers to the skills specific to flying RC aircraft, so they don't have to worry about expensive crashes. At the same time, the extensive, configurable options and varying difficulty levels make this simulation challenging and enjoyable for experienced RC pilots, flight sim pilots or real-world pilots. The custom controller provides excellent control.

Anyone interested in flying RC aircraft should try *RC Pilot*. The experience is real enough that one can get a feel for flying model aircraft, and Great Planes has provided plenty of information for getting started with real RC flying when one is ready. But even those who aren't yet interested in trying the real thing will enjoy buzzing around in the virtual world. I know I did.



RC Pilot Radio Control Model Airplane Simulator

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P.O. Box 9021
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(217) 398-3630
(217) 398-0008 (Fax)

www.rc-pilot.com

FS Global Update

Review by Adam Howe

Since version 5, one major downside for most FS users has been the scenery—there was never enough. Then with FS6, Microsoft added more major cities and details to the sparse countryside. Then FS98 came out and seemed to answer the lingering cries for more airports and scenery. “So why have a new scenery package that replaces FS’s default scenery,” you ask? Two words: “detail” and “accuracy.”

FS has been known for having rivers that do not line up properly and coastlines that are not quite as they are in real life. Pilot’s and The Associates have come to the rescue with the **FS Global Update**. *FS Global Update* derived from the concept of converting Vector data to .BGL files (FS scenery files). This resulted in accurate landscapes with better graphics and texturing that makes the *FS Global Update* the dream come true for a lot of flight simmers. From the Operational Navigational Charts that provide “consistent, continuous global coverage of essential base map features” at a scale of 1:1,000,000, the Pilot’s were able to establish accurate VFR flight with detailed vegetation, transportation and waterways. IFR has been improved with the *FS Global Update* by gathering Navaid information based on B747 onboard systems and real elevation data. The concept was conceived a few years ago, but it took a while to evolve into this package. The manual covers its evolution and concept in detail.

Yes, you read the requirements correctly. The *FS Global Update* is compatible with all FS versions from 5.1 up to the new *Combat Flight Simulator*. The installation of this package is setup to suit the user.

You can do a minimum installation that will use the FSGU’s two CD-ROMs as a booster, similar to the way FS is set up to the FS CD as a booster. The full installation of the package would require one GB of free space on the hard drive. I chose, as I am sure most users will, to use the minimum installation. Even though the package contains 15,872 .BGL files, the installation does not put that many files on the hard drive (unless you do the full install). The installation itself was very simple and easy to follow even without the manual, but there were a lot of ads that seemed to slow the process down a bit—but it does give you something to look at as it installs.



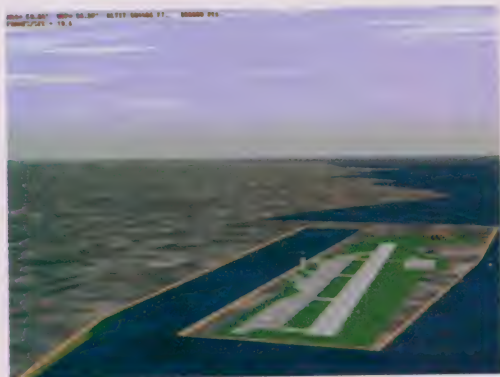
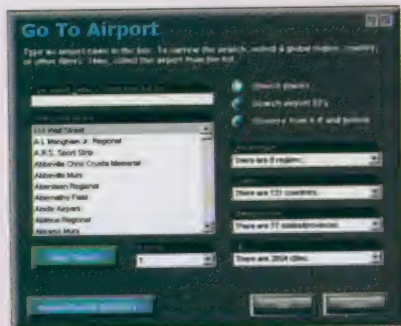
Most manuals these days tell you the basics of the program and do not spend much time going into detail. This manual, on the other hand, dives deep into the history of the package, its concept and installation. It gives explanations from changing the .vis file (FS’s Scenery Library file) to the reasons for using synthetic mountains. You will also find an FAQ section, and the manual comes in three languages: English, German and French. It also covers information regarding frame rates, pauses, DirectX 6.0, 3-D cards, CD booster errors, add-on scenery, SDKs (Software Development Kits from Microsoft), navigation charts, situation files, *FS Global Update* airports and how to contact the company.

For those who are interested in the technical side of the program, *FS Global Update* creates a new .vis file (GBS.VIS) that can be set to automatically load when FS is started. To return FS to your original database, you simply have to enter the Scenery Library in FS and select the “FS98 World.” To return to the Global Update scenery, repeat the process and select the new “FSGlobal Scenery World.” Since there is an abundance of accurate information for the *FS Global Update*, a whopping 21 entries are made in the new GBS.VIS file.

Personally, I found the package to be greatly detailed. The texturing in the package is a far cry from Microsoft’s default terrain. All aspects of the scenery seem to be more detailed and accurate than FS’s default scenery. A few things, however, caused disappointment. The first was Merrill C. Meigs field. FS98 does such a good job of laying out the buildings in the Meigs Field area that seeing the sparse updated scenery (even on the Very Dense complexity setting in FS98) made me wish they had

Product Reviews

incorporated at least some of the detail of FS's default starting point. As you can see in this side-by-side comparison, Meigs field from FS, on the left, contains all the buildings pretty much as they are in real life. The *FS Global Update* scenery, on the right, is not realistic as far as the city is concerned, but the texturing and coastal detail is very accurate. As you may be able to see in the images, the frame rate hit is about the same in each.



I was unable to locate any information on the updated navigation aids. A list of the NavAids would have been nice, even in just a text format on the CD-ROM. The only information I found, in the Airport\Facility Directory in FS98, was a complete list of the airports and relevant information. When selecting NavAids however, none were found. The number of airports included seemed to be a lot less than FS98's default scenery, but the seasonable textures helped me overlook this aspect.



I also use the Abacus *CoPilot* version 2.0 program for most of my flights. I found myself spending about two hours trying to get the scenery files to load into *CoPilot*, to no avail.

The package itself is obviously a great undertaking, and it is apparent that countless hours were spent assembling the package. The package is suited perfectly for people flying IFR from airport to airport who like the NavAids where they should be and like to look out the window to see the beautiful landscapes below. I also find the package to be a great base to build on. If you are into scenery design, the *FS Global Upgrade* is a great place to start from, offering just a few major airports and all the detail you could hope for. For me, this is a definite addition to my FS collection, and I would not be surprised to see downloads on the Net to add on to the *FS Global Upgrade*.

FS Global Update

Pilot's GesmbH
Wipplingerstr. 24-26
A-1010 Wien
Austria
Europe
Phone/Fax: +43 1 535 4010
E-mail: pilots@austrodata.at

Basics of Deciphering International METARs without Toil

On July 1, 1996 the United States switched from airport surface observations and airport terminal weather forecasts to the International Civil Aviation Organization formats.

The hourly surface observations and the airport terminal weather forecasts became known as METAR and TAF.

The old US format and coding changed as well. If I recall correctly, many aviation magazines raised a fuss, and “since no one should be illiterate in the New World order” (*IFR Magazine*, V.12 N.7, July 1996), tons of cheat sheets and other documents were fed to pilots. I know that old habits are hard to kick, but Europeans have used METARs for a long time, since it is simplicity itself.

Until recently, weather conditions were hardly—if at all—considered when establishing an FS flight plan. At best, one might timidly modify Flight Simulator’s weather areas and cloud layers with random and sometimes inaccurate weather data and, for extra hair-raising sensation, add wind and turbulence. However, we would not have real weather at any stage of the flight.

For the time being, *Flight Director* ‘9x and *FS Weather Plus* are the only software capable of using METAR data taken from the Internet to update *Flight Simulator*’s weather engine, creating random enroute weather with accurate real-world weather at the FS airports.

The user downloads the METAR text(s) from the Internet and loads it into *Flight Director* ‘9x, which then makes the necessary modifications to *Flight Simulator*’s weather modules.

If the user is curious, he will no doubt peek at the METAR file and in most instances will wonder what the heck are all those codes and their meaning. The software decodes the METAR data into plain English.

If you do not have *Flight Director* ‘9x, then all is not lost. Connect yourself to the Internet and browse to <http://weather.noaa.gov/pub/data/observations/metar/cycles/>. Here you’ll find METARs for many world airports. Just download any or all files. File names are in a 24-hour format followed by the letter “Z.” (If you wanted the noon UTC METAR file, you would download 12Z.TXT)

By Phil Paschutine

Basics of Deciphering International METARs

Inset #1

Cloud types

High-altitude clouds

Above 20,000 ft

Cirrus (CI)

Cirrocumulus (CC)

Cirrostratus (CS)

Middle-altitude clouds

Between 6,000 and 20,000 ft

Altostratus (AS)

Altostratus (AS)

Low-altitude clouds

Below 6,000 ft

Stratocumulus (SC)

Stratus (ST)

Clouds having a great vertical extension

Nimbostratus (NS)

Cumulonimbus (CB)

Towering Cumulus (TCU)

Other clouds

Cumulus (CU)

Once the download is complete, open the file and locate your airport by its ICAO station identifier. Go into *Flight Simulator* and create your own local weather based on the METAR data for your airport. At least that is what you would do if you knew how to read METARs!

Before we start deciphering the METAR code, look at inset 1 (page 90) for a refresher on cloud types and at inset 2 (page 90) for qualifiers (intensity, proximity, descriptors) and weather phenomena.

This article intends to provide the basics for decoding METARs that you can use to change weather conditions in *Flight Simulator*, so I will leave out some of the METAR details. In addition, the METAR data I am using in the examples does not reflect any actual weather type.

The METAR text files that can be downloaded from the Internet use both International and US formats. As there are some essential differences between the two formats (see inset 2), I will first deal with the international METAR, saving the US METAR description for a later article.

Inset 2

Key differences between the US and International METAR

Altimeter settings

US	Inches of mercury
International	hectoPascals (millibars)

Winds

US	Knots
International	Knots, kilometers per hour or meters per second

Visibility

US	Prevailing visibility, in statute miles
International	Four digits using meters with the direction of the lowest visibility sector. Also trends as Down, Up, No change and Variable

Other

US	RMK, no trend
International	CAVOK, NSC (no significant clouds), temperature, turbulence and icing forecasts

Overview

METAR is the acronym of *ME*teorological *A*erodrome *R*eport. A METAR is issued every hour on the hour and every half-hour for the major airports.

METARs are coded so that everyone can understand them. They include estimates (such as visibility) and measured parameters (such as pressure and temperature).

Let us start with a simple "wish weather was like this" METAR. The proper sequence is:

Station identifier/date and time/wind/CAVOK

The METAR consists of the station identifier, the day of the month and time UTC (Zulu time), the wind direction and speed and "Ceiling and Visibility OK".

Station identifier: ICAO station identifier

Date time: day of the month and time UTC (Zulu time)

Wind: wind direction and speed

CAVOK: acronym of Ceiling and Visibility OK, defined as

→ Visibility > 10 km

→ No clouds below 1,500 m (or above, depending on local conditions)

Basics of Deciphering International METARs

METAR KATL 152300Z 18002 CAVOK

Ceiling & Visibility OK

Winds from the south (180°) at a speed of 02 kts

11:00pm (23:00 UTC)

15th day of the month

Atlanta

- No cumulonimbus
- No precipitation
- No thunderstorm
- No sandstorm
- No duststorm
- No shallow fog
- No drifting dust, sand
- No snow at low altitude

If one of the CAVOK conditions is not met, each group (see below) will have to be developed. (Note: CAVOK is not used in the US METAR form.)

A METAR is coded in this sequence:

Station identifier/ Date time/ Wind group/ Variable wind group/ Visibility group/ RVR group/ Present weather group/ Clouds group/ T° and dew point group/ Sea-level pressure (QNH) group/ Recent weather group/ Takeoff and landing conditions group/ Trends group

Message type: METAR or SPECI (see inset 5)

ICAO station identifier

Date and time: e.g., 1998/05/25 05:53

Surface wind velocity (direction and speed), plus behavior (gusty or variable wind) if applicable.

Horizontal visibility (and Runway Visual Range if visibility falls below 1,500 m)

Present weather conditions

Clouds (Cover in eighth (octas) of the vault and height in 100s of feet above the station)

Air temperature and dew point

Sea-level pressure (QNH)

Recent weather, windshear alerts, runway state (takeoff and landing conditions)

Trends

Example #2:

METAR 1998/05/25 1200

KATL 12007KT 0500 R01R/800U FG +RA SCT010 FEW013CB
3 BKN090 OVC250 02/M01 Q1018 BECMG AT1400 9999
SKC=

Translation:

METAR message on **May 25th, 1998**, at **noon** UTC

KATL: **Atlanta** (four-letter ICAO code).

12007KT describes the average surface wind 10 minutes before the observation. The wind is coming from the southeast (120°) at a speed of seven knots.

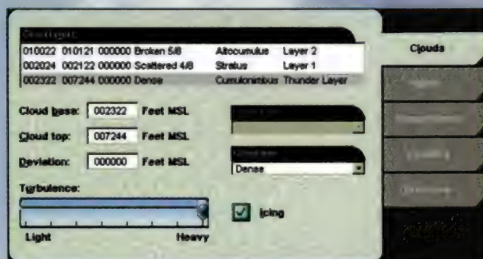
In the International METAR, wind speeds can be expressed in meters per second (MPS), kilometers per hour (KMH) or knots (kts).

If the wind is gusty, this group will be coded as **12006G22KT**: here the wind is coming from 120° at six knots with gusts at 22 knots.

If during a 10-minute evaluation period, the wind direction varies and wind speed is less than three knots, code **VRB** will be inserted instead of the first three numbers: **VRB02KT** (variable wind at two knots).



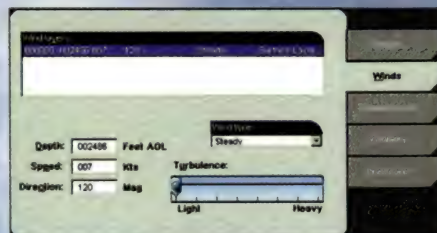
Important FS Weather Features



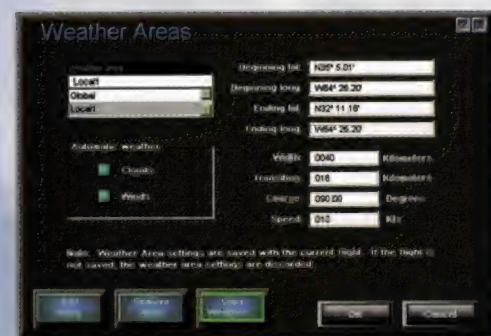
Advanced weather - clouds tab



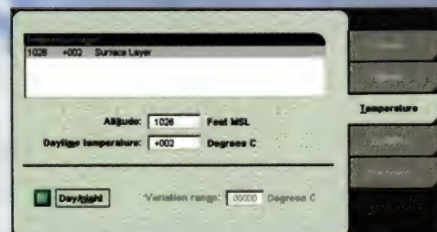
Advanced weather - pressure tab



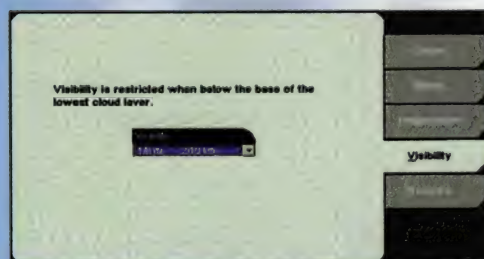
Advanced weather - winds tab



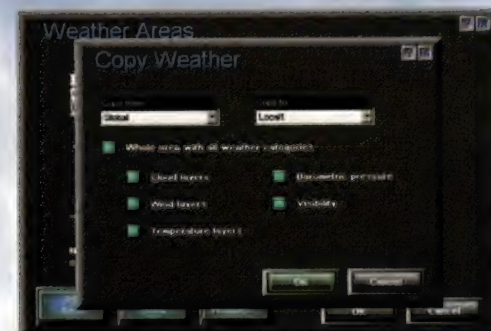
Weather area - add



Advanced weather - temperature tab



Advanced weather - visibility tab



Weather area - Copy weather

Basics of Deciphering International METARs

Weather Phenomena	Descriptors	Intensity value	Others		
BR	Mist	BC	Patches	Light	VRB: Variable heading (winds)
DS	Dust Storm	BL	Blowing	No sign : moderate	
DU	Widespread Dust	DR	Low Drifting	+ : heavy	
DZ	Drizzle	FZ	Supercooled/freezing	VC : Vicinity	
FC	Funnel Cloud	MI	Shallow		
+FC	Tornado/Water Spout	PR	Partial		
FG	Fog	RE	Recent (in the last hour)		
FU	Smoke	SH	Showers		
GR	Hail	TS	Thunderstorm		
GS	Small Hail/Snow Pellets	XX	Violent		
HZ	Haze				
IC	Ice Crystals				
PE	Ice Pellets				
PO	Dust/Sand Whirls				
PY	Spray				
RA	Rain				
SA	Sand				
SG	Snow Grains				
SN	Snow				
SQ	Squall				
SS	Sandstorm				
UP	Unknown Precipitation (Automated Observations)				
VA	Volcanic Ash				

Some combinations: Descriptor precedes the phenomena (except for SH)

-FZRA	= light freezing rain
+SHRA	= heavy showers of rain
BLSN	= blowing snow
RADZ	= rain & drizzle
RASN	= sleet (rain & snow)
RERA	= recent rain
SNSH	= snow showers
TSGR	= thunderstorm with hail
XXTS	= violent thunderstorm

If during a 10-minute evaluation period the wind direction varies and the average wind speed is greater than six knots, the variable wind group will be coded as: **200V32022KT** (wind variable from 200° to 320°, at 22 knots).

Finally, many flight simmers never change weather parameters in *Flight Simulator*, so by default the wind group is 00000KT (calm).

0500: horizontal surface visibility (in meters). Here it is 500 meters. Visibility of 10 km or more is coded as 9999. You can also have multi sector visibility, but we will skip that.

R01R/800U: RVR (Runway Visual Range) runway 01R has a horizontal surface visibility of 800 meters and increasing. The RVR group will follow the visibility group if horizontal visibility is less than 1,500 m.



Basics of Deciphering International METARs

International format of the METAR/SPECI code

Message type/ Location identifier/ Date time group/ Wind group/ Variable wind group/ Visibility group/ Runway visual range group/ Present weather group/ Clouds group/ Temperature & Dew point groups/ Sea-level pressure group/ Recent weather group/ Takeoff and landing conditions group

US format of the METAR code

Message type/ Location identifier/ Date time group/ Corrected or automated obs group/ Wind group/ Variable wind group/ Visibility group/ Runway visual range group/ Present weather group/ Sky condition group/ Temperature & dew point group/ Sea-level pressure group/ Recent weather group/ Remarks section group

When you see an RVR group, you can forget VFR. You have the letter **R** (for runway), followed by the runway number and identifier, if any (L, R or C).

If RVR was deteriorating, the above would read "R01R/800D," and "R01R/800N" describes no change.

FG +RA: Fog and heavy rain. Present weather is composed of a qualifier and the phenomena. (See inset 3.)

SCT010 FEW013CB BKN090 OVC250: clouds group (up to four).

SCT010: scattered clouds at 1,000 ft above airport height.

FEW013CB: few cumulonimbuses at 1,300 ft above airport height.

BKN090: broken clouds at 9,000 ft above airport height.

OVC250: overcast clouds at 25,000 ft (see inset 1).

If you are familiar with octas:

0 is SKC (sky clear)

FEW is up to 1 or 2 octas

SCT (scattered) is 3-4 octas

BKN (broken) is 5 through 7 octas

OVC (Overcast) is 8 octas.

You may also see the following: 1CU015 5CU020 8SC040. Here we have the cloud coverage in **octas**, followed by the cloud type and height above the surface.

The cloud group can also include the following:

If there are cumulonimbus clouds (CB) or towering cumulus clouds (TCU), you will read something such as "SCT022CB," meaning 3-4/8 cumimbs at 2,200 ft.

A SPECI is an unscheduled report that includes all the data elements found in a METAR, as well as extra plain-language information elaborating on data in the body of the METAR.

SPECIs are issued soon after several criteria have been observed: Aircraft mishap, ceiling, precipitation, RVR changes, sky condition, squalls, thunderstorm (begins or ends), tornado, funnel clouds or waterspouts (begins or ends), visibility changes, volcanic eruption (first eruption), Wind shifts and others.

Basics of Deciphering International METARs

In case of fog, the cloud group will start with the letters "VV," followed by the vertical visibility in 100s of feet (three digits): *i.e.*, "VV022" indicates that vertical visibility is 220 ft.

02/M01: 02° Celsius air temperature and -1° Celsius dew point (negative temperatures are preceded by the letter "M").

Q1018: Sea-level pressure in HectoPascal (millibars).

Trends:

BECMG AT1400 9999 SKC

Translates as:

Present visibility at 2 pm becoming greater or equal to 10 km sky clear.

A trend is a forecast of what is to come in the next two hours: ceiling, winds, thunderstorms and precipitation.

NOSIG: No significant changes in the next two hours.

GRADU: change that will happen at a constant pace

RAPID: change that will happen in a time span of less than 30 minutes.

TEMPO: changes that will stretch over less than an hour and happen infrequently, so that dominant conditions will not be the ones described earlier.

INTER: frequent but brief changes

TEND: used when the other terms are not applicable.

Other Groups

In some cases, the **takeoff and landing conditions group** will be inserted between QNH and Trends. You can have windshear notifications: **WS** (*i.e.*: WS TKOF rwy 01).

Recent weather changes that no longer exist at the time of observation, but happened in the last hour (as in the case of freezing rain: REFZRA).

As you see, METAR decoding isn't difficult. The hard part is for the pilot to accurately and quickly interpret the data while flying, and only many hours of flying in *Flight Simulator* with real METAR data will give you that experience.

I will let you figure out these three METARs:

1998/05/26 15:00

LFPG 261500Z 23009KT 9999 VCSH FEW033CB SCT043 BKN060 16/10 Q1006 NOSIG

1998/05/25 00:44

RJCC 250044Z 18014KT 4000 -RA BR FEW002 BKN004 BKN008 12/11 Q0994

1998/05/25 00:44

UTTT 250000Z 02003MPS CAVOK 18/13 Q1015

Now that METAR code is no longer Egyptian hieroglyph, you can create your own airport weather. Start *Flight Simulator*, go to Atlanta and use the following information (make sure the "Advanced weather" option is on).

KATL 12007KT 0500 R01R/800U FG +RA SCT010 FEW013CB 3 BKN090 OVC250 02/M01 Q1018

Winds and force, horizontal visibility, temperature and QNH are no big problem. The only problem is that *Flight Simulator* will only allow you to create two cloud layers. For some reasons, when three layers are active, one must specify the cumulonimbus (thunderstorm) type.

And finally, for old time's sake, here is:

ICT SP 1341 3 SCT M8 BKN 20 OVC 1 1/2 TRW 132/ 72/ 64/ 0214G25/ 992/ R01VR30V50 T SW MOVG E RB25

VFR anyone?

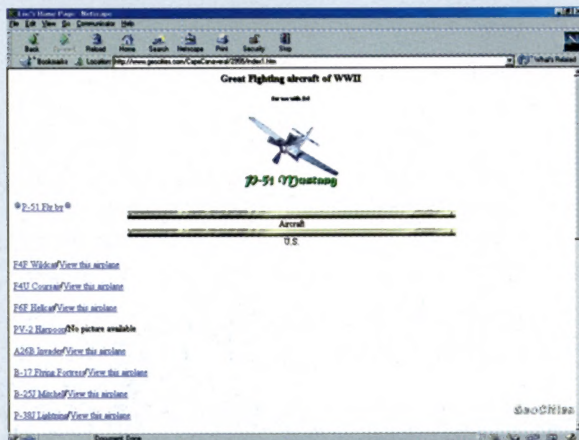


Internet Sites for Simmers

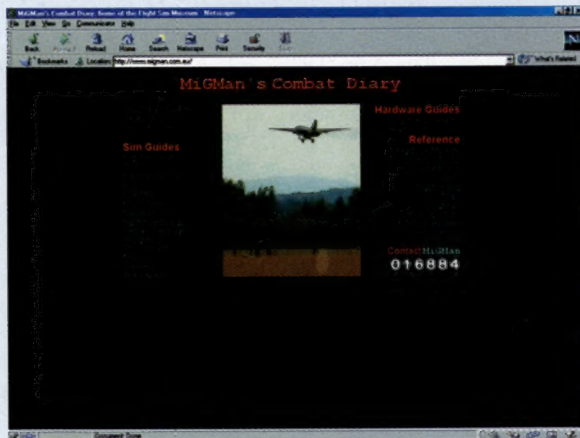
Continued from page 57

This was not my most favorite mission, but I found it informative. The missions available for download are explained in an almost role-playing (RPG) manner, giving you all the necessary build up of character and objective needed to proceed successfully.

Be sure to stop by the download page for a unique list of FS5 aircraft, which can be converted using the Converter included with CFS. The links page can be helpful to locate some of the hard-to-find FS oriented sites.

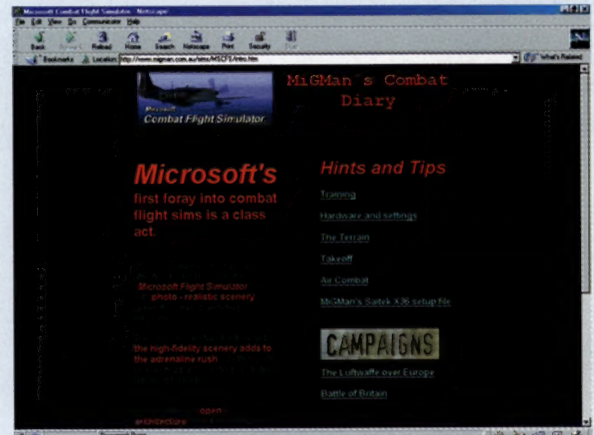


The final mission on our campaign brings us to <http://www.migman.com.au>.

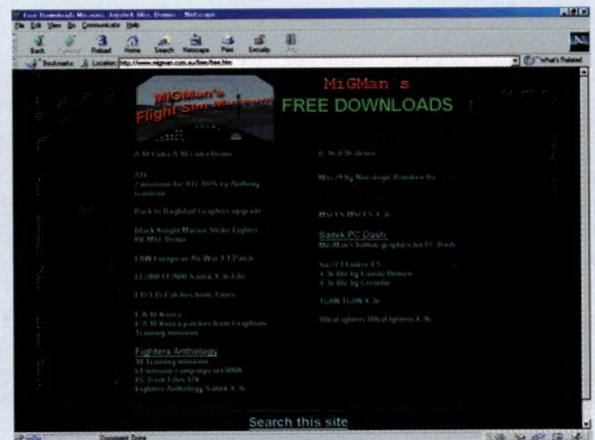


I was quite impressed by the abundance of information available at this site. It is not only a CFS hot spot, but contains information for all of the hot combat sim games on the market today including: Jet Fighter III, MIG 29, F-16 MRF and others. The beginners guide is a nice place to visit for those new to the realm of combat simming. You will also find information on gamming hardware for your

simming, from joysticks to 3-D glasses. The Reference area on this site contains videos, maps, fiction, reference books, virtual squadrons and newsgroups.



Those surfing aces who just cannot get enough can check out <http://www.smooth-ops.com>. I found this site to be a bit lacking in the usual areas, but it exceeded in useful information about on-line gambling. If you are having trouble playing on the Net, this is the place to solve your problems.



If you know of a FS/CFS site that other *Full Throttle* readers would enjoy, feel free to drop a note to adam@ftmagazine.com, and I will check it out—with proper credit of course!

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